A4095 / B4100 Banbury Road Roundabout Improvements

Option Assessment Report (OAR)

Oxfordshire County Council

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1 Introduction

1.1 Background

1.1.1 AECOM has been commissioned by Oxfordshire County Council to (OCC) to provide advice, design and planning services in connection with the A4095 / B4100 Banbury Road Roundabout Improvements Scheme (the Scheme) in Bicester.

1.1.2 The commissioned services include:

- The development of transport improvement options;
- An assessment of options and identification of a preferred option;
- Preliminary design of the preferred option, including scheme cost estimate; and
- Preparation of the planning application for the project.

1.1.3 Bicester town is located in the district of Cherwell. Bicester is a historic market centre located approximately 15 miles northeast of Oxford in Oxfordshire, with a population of 32,642 as per the 2011 Census. It is one of the fastest growing towns in Oxfordshire and forms part of the Oxfordshire Knowledge Spine (Science Vale – Oxford – Bicester), which is seen as a key driver for growth in Oxfordshire Local Enterprise Partnership's Strategic Economic Plan. In 2009, Bicester was nominated as one of four Eco Towns in the UK, and in 2014, it was awarded Garden Town status.

1.1.4 Oxfordshire has committed to the delivery of 100,000 new homes between 2011 and 2031[1], 10,129 of which are allocated in Bicester, including the delivery of 138.5 ha of employment land[2] in the town. To deliver the growth targets in Bicester, the Cherwell District Local Plan (2011-2031) identifies a number of Strategic Development Sites across the town, including the North West Bicester Eco-Town, a zero carbon mixed use development expected to deliver 6,000 homes and at least 4,600 jobs. The North West Bicester development is located in the northwest of Bicester and is connected to the A4095 / B4100 Banbury Road roundabout. Figure 1 shows the location of the roundabout and the North West Bicester development site.

1.1.5 Previous modelling undertaken for North West Bicester has forecast a significant increase in the number of trips as a result of the development, which is likely to cause congestion and capacity issues in the nearby transport network, including at the A4095 / B4100 Banbury Road roundabout[3]. Without intervention, there are likely to be significant negative impacts on the highway network at and around the roundabout, which would have wider negative impacts, for example on journey times, emission levels and attractiveness for investment.

[1] Oxfordshire County Council Local Transport Plan 4 (https://mycouncil.oxfordshire.gov.uk/documents/s33704/Background%20CA_JUN2816R07%20Connecting%20Oxfordshire%20vol%201%20-%20Policy%20and%20Overall%20Strategy.pdf)
[2] Cherwell District Council Local Plan 2011-2031 (https://www.cherwell.gov.uk/downloads/download/45/adopted-cherwell-local-plan-2011-2031-part-1-incorporating-policy-bicester-13-re-adopted-on-19-december-2016)
[3] NW Bicester Application 1: Land North of the Railway Line Transport Assessment (Hyder Consulting UK Limited-2212959)

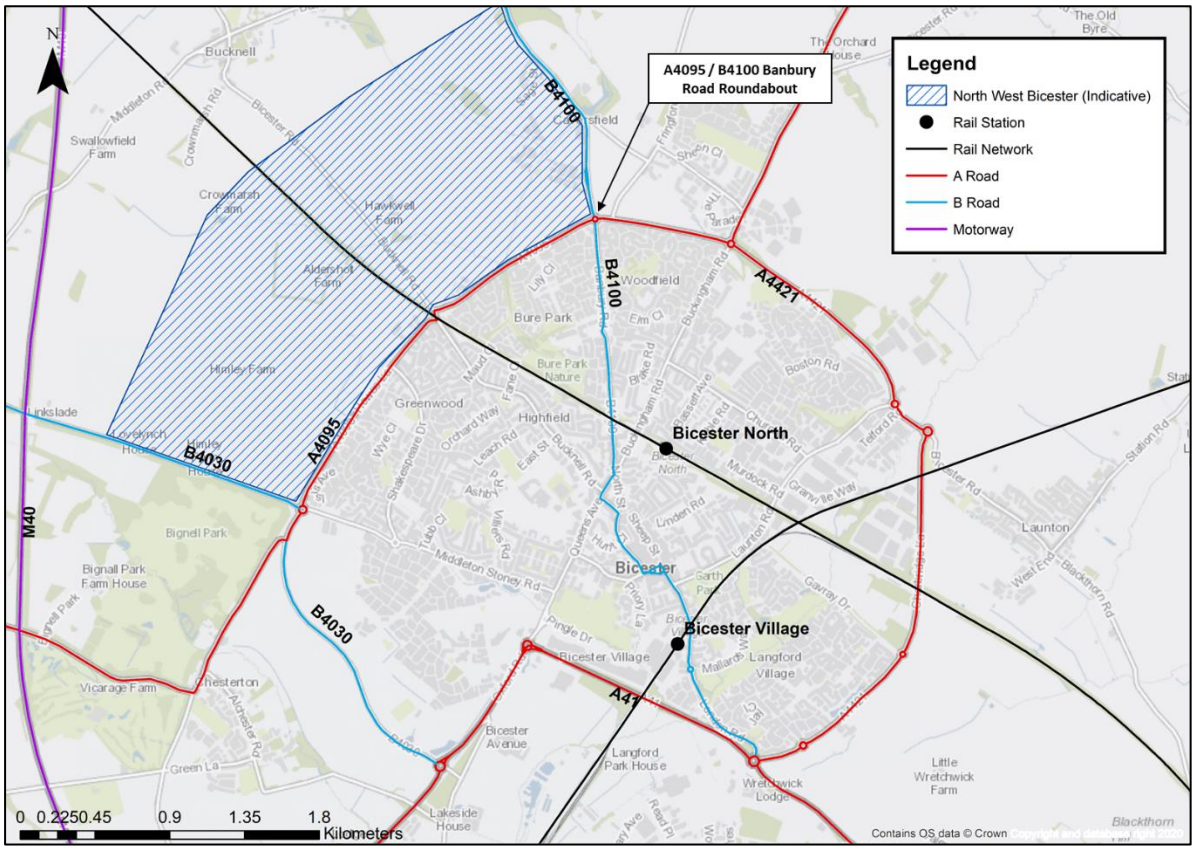

Figure 1. A4095 / B4100 Banbury Road Roundabout Location

Source: AECOM @ Crown copyright and database right 2021

1.2 Report Purpose

1.2.1 This Option Assessment Report follows the DfT Transport Appraisal Guidance (TAG), as illustrated in DfT's Transport Appraisal Process (TAP) (Figure 2). It provides a summary of steps one to seven in Stage 1 of the appraisal process – Option Development – including the review and summary of the work to date.

1.2.2 In this way, this report documents the option generation and appraisal process for the Scheme, including the selection of a preferred option. By adhering to TAG a robust and transparent evidence base is developed so that the right option is identified, with the best chance of ensuring that the project objectives will be met. To inform the option appraisal process, this report:

- Sets out the study context;
- Discusses the current and future conditions, and objectives for the project;
- Provides details of the approach to option generation and appraisal; and
- Summarises the results of the option appraisal.

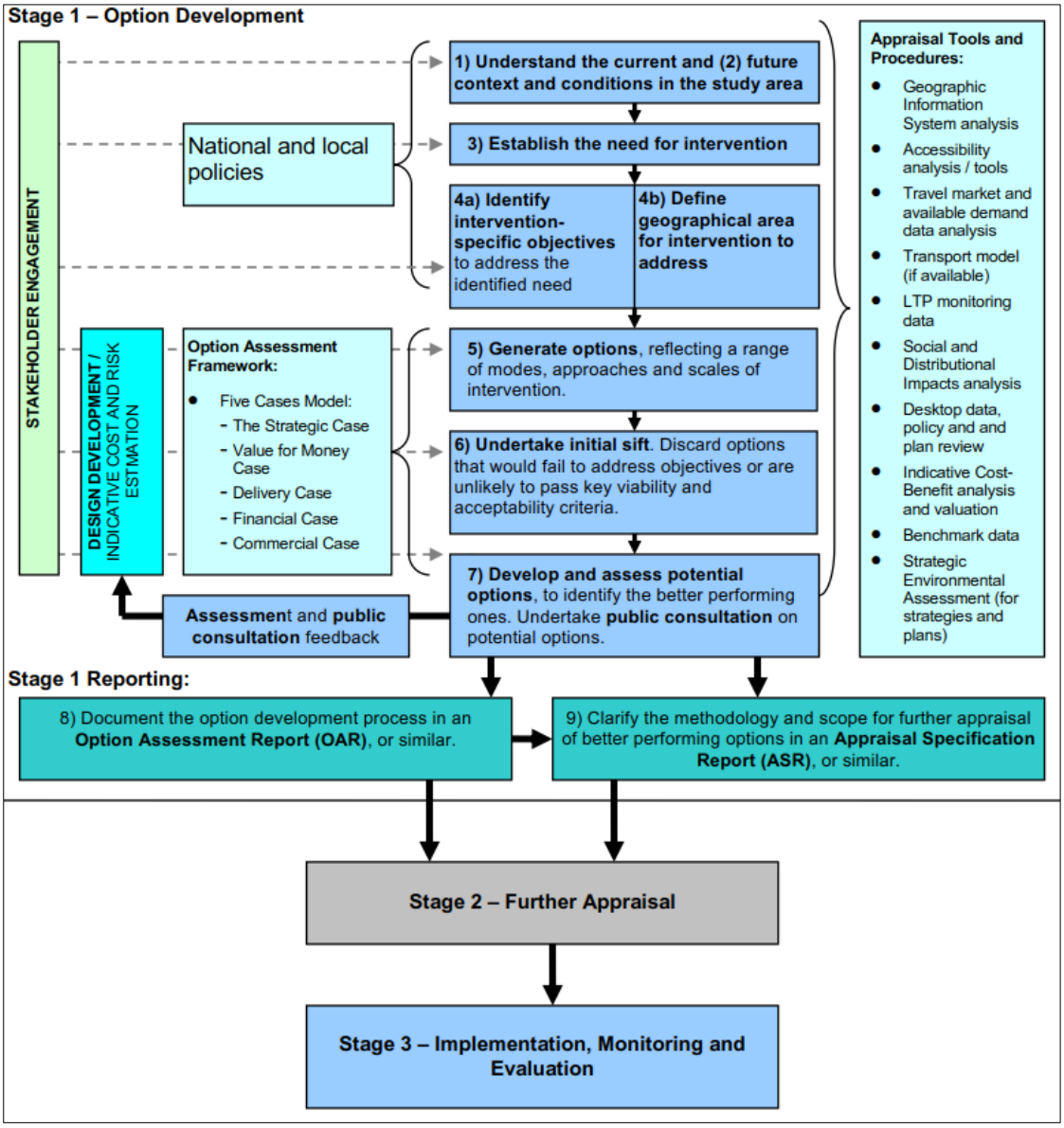

Figure 2. DfT's Transport Appraisal Process

Source: Transport Appraisal Process (DfT, 2018)

1.3 Report Structure

1.3.1 Following this introductory chapter, this report is structured as follows:

- Chapter 2: Policy Context;
- Chapter 3: Current and Future Context;
- Chapter 4: Development of Project Objectives;
- Chapter 5: Option Development and Sifting; and
- Chapter 6: Conclusion.

2 Policy Context

2.1 Introduction

2.1.1 A review of relevant national, regional and local policies (Table 1) was undertaken to understand policy direction and goals, and how these inform the nature of intervention that could be considered. This review has informed the development of the project objectives (see Chapter 4). These objectives will be important appraising options, as well as becoming a key component against which the final proposed solution will be appraised and, following implementation, evaluated.

Table 1. Key Reviewed Policy Documents

National		
National Planning Policy Framework, Ministry of Housing, Communities & Local Government	National Infrastructure Strategy, HM Treasury	Industrial Strategy White Paper, Department for Business, Energy & Industrial Strategy
Transport Investment Strategy, Department for Transport	Gear Change: A bold vision for cycling and walking report; A Better Deal for Bus Users, Department for Transport	Housing White Paper – Fixing Our Broken Housing Market, Department for Communities and Local Growth
Regional		
Strategic Economic Plan for Oxfordshire 2016, Oxfordshire Local Enterprise Partnership	Connecting Oxfordshire: Local Transport Plan 2015-2031, Oxfordshire County Council	Oxfordshire Infrastructure Strategy, Oxfordshire County Council
Oxfordshire Local Industrial Strategy, Oxfordshire County Council	Oxfordshire Investment Plan, Oxfordshire County Council	Oxfordshire's Housing and Growth Deal, Oxfordshire County Council
Local		
Bicester Area Transport Strategy, Oxfordshire County Council	Active and Healthy Travel Strategy; Bicester Local Cycling and Walking Infrastructure Plan, Oxfordshire County Council	Cherwell District Council Local Plan 2011-2031; Infrastructure Delivery Plan, Cherwell District Council
Bicester Movement Study; Eco Bicester One Shared Vision, Oxfordshire County Council	Bicester Healthy New Town Programme; Bicester Sustainable Transport Strategy, Cherwell District Council	North West Bicester Supplementary Planning Document; Sustainable Transport Strategy, Cherwell District Council

2.1.2 The impact of restrictions on the functioning of society in response to COVID-19 has led to significant changes in travel patterns, public transport usage, active travel mode share, and lockdowns have created significant impacts on economies and communities. Some of these changes and impacts could be short term but others may have long term effects on travel demand and patterns. Policy is changing and will change to address the economic and socio-economic impacts arising from COVID-19. Recent policies and literature published during the COVID-19 pandemic have been reviewed and their relevance considered to the BRRI scheme, such as the DfT's Gear Change: A bold vision for cycling and walking report (2020).

2.2 National Policies

2.2.1 At a national level, Government policy endeavours to balance the need to deliver economic growth for a growing population, increased housing demand and increasingly congested transport networks with a longer-term vision of a sustainable and carbon neutral economy, which makes better use of available capacity and technology. These are reflected in the National Planning Policy Framework (NPPF), National Infrastructure Strategy, Industrial Strategy White Paper, the Housing White Paper, and the DfT's Transport Investment Strategy.

2.2.2 The **NPPF** (2012) seeks to promote sustainable transport and states that significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes.

2.2.3 The **National Infrastructure Strategy** (2020) presents the government's approach to levelling up the country through a radical improvement in the quality of the UK's infrastructure. The Strategy aims to boost growth and productivity across the whole of the UK, decarbonise the economy, support private investment in infrastructure, and accelerate and improve delivery. Improvements to the transport network are recognised as vital in achieving these aims.

2.2.4 The **Industrial Strategy** (2017) states that the availability of high-quality infrastructure is essential for continued growth and prosperity. The Strategy's vision for a transformed economy is centred around productivity, and infrastructure is identified as one of the five foundations of this.

2.2.5 The **Housing White Paper** – Fixing Our Broken Housing Market (2017) sets out initiatives that strive to reach a step-change in housing supply in England. There are four key proposals contained within the housing strategy:

- Planning for the right homes in the right places;
- Building homes faster;
- Diversifying the market; and
- Helping people now.

2.2.6 The role of transport in supporting local growth is highlighted in the DfT's **Transport Investment Strategy** – Moving Britain Ahead (2017), which states that transport investment must seek to create a better and more reliable transport network in order to build a stronger, more balanced economy, enhance productivity and respond to local growth priorities. Its objectives are to:

- Create a more reliable, less congested, and better-connected transport network that works for the users who rely on it;
- Build a stronger, more balanced economy by enhancing productivity and responding to local growth priorities;
- Enhance the global competitiveness by making Britain a more attractive place to trade and invest; and
- Support the creation of new housing (the Housing White Paper recognises transport infrastructure as one of the keys to unlocking development and delivering places where people want to live).

2.2.7 The **Gear Change: A bold vision for cycling and walking report** (2020) aims to see a step-change in cycling and walking in the coming years. The report notes that increasing cycling and walking can help tackle some of the most challenging issues faced by society: improving air quality, combatting climate change, improving health

and wellbeing, addressing inequalities and tackling congestion. This will help create better connected, healthier and more sustainable communities. This document is accompanied by the DfT's new 'Cycle Infrastructure Design: Local Transport Note 1/20'. Whilst the 'Gear change' sets out the DfT's aims and vision for the future, the Cycling infrastructure design standard LTN 1/20 provides the practical advice to achieving the stated policy aims. The main shift between LTN 1/20 and previous design guidance is the establishment of core design principles (20 design principles). This is especially pertinent in light of the COVID-19 restrictions and its future impacts on travel pattern (which has profoundly affected the way individuals live, work and travel and increased the desire to be more active). The BRRI scheme design will refer to these design principles.

2.2.8 **A Better Deal for Bus Users**[4] (2020) highlights the key role which bus plays in the transport system and sets aside £220 million to provide bus services which meet the needs and demands of the public. As part of this, bus priority is identified as a key tool to improve bus services. All new road investments in England which receive central government funding will now be required to either support bus priority measures or explain why bus priority is not necessary. There will be further support for local authorities to ensure they have the information they need to effectively prioritise buses.

2.3 Regional Policies

2.3.1 Oxfordshire Local Enterprise Partnership's (OxLEP's) **Strategic Economic Plan** (SEP) for Oxfordshire (2016) sets out a vision for Oxfordshire to be a vibrant, sustainable, inclusive, world leading economy, driven by innovation, enterprise and research excellence. Whilst being strong in many areas, including innovation, enterprise and research, the county has challenges such as the lack of affordable housing, increasing levels of congestion, the need for greater resilience in transport networks, and improvements to sustainability and inclusion. The SEP is clear that the overall priority for Oxfordshire's places is to plan simultaneously for both jobs and housing growth, putting in place the infrastructure required for both, whilst also protecting and where possible enhancing environmental quality and social inclusion. These priorities are consistent with central Government policy and the objectives set out in the DfT Transport Investment Strategy but adapted to suit Oxfordshire's own socio-economic and environmental challenges.

2.3.2 In terms of connectivity, the SEP sets out key actions, a number of which are relevant to the BRRI scheme, in particular:

- Support for the implementation of the Oxfordshire Local Transport Plan 2015-2031 to address congestion and to identify ways to avoid exacerbating existing problems due to growth;
- Ensure, through the planning process, that connectivity improvements are linked to the scale and location of planned growth; and
- Implement the Oxfordshire Active and Healthy Travel Strategy.

2.3.3 OxLEP has also produced the **Oxfordshire Local Industrial Strategy** (LIS, 2019) and accompanying Oxfordshire Investment Plan**.** The LIS responds to the government's UK Industrial Strategy and sets out a bold and ambitious vision for Oxfordshire to be one of the top three global innovation systems by 2040. The LIS aims to deliver clean and sustainable transformative growth across Oxfordshire, through focussing on

[4] A Better Deal for Bus Users (https://www.gov.uk/government/publications/a-better-deal-for-bus-users/a-better-deal-for-bus-users, 2020)

innovation, people (including an Oxfordshire Social Contract with investment in skills) and improvements to the physical, digital, financial, knowledge and social infrastructure. The **Oxfordshire Investment Plan** (LIP, 2020) takes forward the ambitions set out in the LIS, translating policy ideas and commitments to a transformational programme for action and delivery. North West Bicester Eco-Town is considered a key housing development in both of these documents, which will contribute to addressing some of the 'grand challenges' in the County, specifically relating to growing the data driven economy, shifting towards clean growth, shaping the future of mobility, and meeting the needs of an ageing society.

2.3.4 The **Oxfordshire's Housing and Growth Deal**[5] (2018) is an agreement between the national government and the Oxfordshire area councils (Cherwell District Council; Oxford City Council; Oxfordshire County Council; South Oxfordshire District Council; Vale of White Horse District Council; West Oxfordshire District Council) and the Local Enterprise Partnership (OxLEP) to plan and support the delivery of 100,000 new homes between 2011 and 2031. The Scheme supports this ambition by unlocking Local Plan housing growth, which contributes to the Oxfordshire Housing and Growth Deal.

2.3.5 The **Oxfordshire Infrastructure Strategy** (OXIS, 2017) recognises Bicester as part of Knowledge Spine North, one of the Growth Corridors in Oxfordshire with key strategic sites along it, including North West Bicester. The OXIS highlights infrastructure requirements to 2040 and identifies the need to provide a cycle corridor which connects North West Bicester with the town centre.

2.3.6 The **Connecting Oxfordshire Local Transport Plan 4** (LPT4, 2016), is the overarching local plan for transport in Oxfordshire. The LTP4 sets out three overarching goals for transport up to 2031, including:

- To support jobs and housing growth and economic vitality;
- To reduce emissions, enhance air quality and support the transition to a low carbon economy; and
- To protect and enhance Oxfordshire's environment and improve quality of life (including public health, safety and individual wellbeing).

2.3.7 Road safety is a key concern in the LTP4, with two policies – Policy 30 and 31 – concerned with identifying accident hot spots, proposing solutions to prevent accidents, and working with partners to support road safety campaigns and programmes.

2.3.8 The LTP4 is part of the Connecting Oxfordshire series of documents which includes the Science Transit Strategy, Rail Strategy, Bus and Rapid Transit Strategy, the Active & Healthy Travel Strategy and the Bicester Area Transport Strategy, the latter two which are discussed further below. LTP5 is currently being developed and further work will also be undertaken to review and update the Bicester Area Transport Strategy.

2.4 Local Policies

2.4.1 The **Bicester Area Transport Strategy** (2016) sets out OCC's transport vision and strategy up to 2031 for the Bicester area as part of the LTP4. Improved access to the strategic road network, as well as making it easier for people to travel between homes

[5] Oxfordshire Housing and Growth Deal (2018, https://www.gov.uk/government/publications/oxfordshire-housing-deal)

and jobs, is seen as critically important to accommodate the future growth in Bicester. To achieve this, the Strategy identifies the following strategic aims:

- To increase highway capacity on the peripheral routes to make these attractive to employment and longer distance traffic and thereby reduce the strain on the town centre and central corridor;
- To implement a sustainable transport strategy within the town centre, enabling active and healthy travel options; and
- To accommodate proposed strategic rail initiatives.

2.4.2 To accommodate future growth, including the North West Bicester development, the Strategy supports improvements to the A4095 western peripheral corridor and specifically to the A4095 / B4100 roundabout junction.

2.4.3 The **Active and Healthy Travel Strategy** (2016) also builds on the LTP4 with the aim to '*contribute to reducing pressure on the road network, contribute to economic growth and the reduction of emissions, quality of life and health, and link active travel with bus and rail options by enabling sustainable door to door journeys combining cycling or walking with public transport'*. The strategy outlines that cycling alone cannot replace the car for long journeys but does state that the combination of cycling and public transport can create more door-to-door sustainable trips. There is also encouragement of walking and to prioritise funding available for the best value for money investments for walking and a commitment to provide a safer environment for cyclists.

2.4.4 **Cherwell District Council** adopted their **Local Plan (2011-2031)** in 2015, noting that it is underpinned by a general presumption in favour of sustainable development. The Local Plan envisions Cherwell District to be an area where all residents enjoy a good quality of life by 2031, an area which will be more prosperous than today and where people are happier, healthier and feel safer. To achieve this, the Local Plan outlines strategic objectives in line with the three themes of developing a sustainable local economy, building sustainable communities, and ensuring sustainable development. The strategic objectives revolve around facilitating economic growth, meeting housing needs, providing accessible and good quality services, facilities and infrastructure, adapting to climate change, reducing the dependency on private car, as well as protecting and enhancing the historic and natural environment.

2.4.5 The Local Plan highlights the importance of improving the road, rail and public transport links, particularly by implementing measures that manage road congestion, improves public transport and enables access to town centres and shops and services. As part of the Local Plan, the **Cherwell District Infrastructure Delivery Plan** (IDP) has been adopted which identifies the infrastructure which is needed to support future growth in Cherwell until 2031. Highway capacity improvements to the peripheral routes in Bicester, including improvements to A4095 Howes Lane / Lord's Lane, and a cycle route from North West Bicester along B4100 until the A4095 / B4100 junction are included in the IDP.

2.4.6 The A4095 Realignment scheme is a key scheme coming forward in Bicester. Phase 1 of the scheme involves the provision of two underpasses, one for motorised traffic and one for pedestrian and cyclists, to the railway line near the Howes Lane / Bucknell Road junction. This phase is expected to be completed in July 2021. Phase 2 of the scheme is currently under feasibility assessment and involves the realignment of Howes Lane between Middleton Stoney Road roundabout to approximately 500 metres from the A4095 / B4100 Banbury Road roundabout, including segregated provision for pedestrians and cyclists. This phase is expected to be completed in 2024.

2.4.7 The Local Plan contains several policies which are related to the BRRI scheme:

- The Local Plan's Policy SLE 4 states that the Council will support transport proposals in Bicester in accordance with the Local Transport Plan and Bicester Movement Study, including improvements at the A4095 / B4100 roundabout junction, to deliver key connections, to support modal shift and to support more sustainable locations for employment and housing growth;
- In determining measures to improve transport and connections, the Local Plan states that encouragement will be given to solutions which support reductions in greenhouse gas emission and reduce congestion;
- The Local Plan recognises that the town of Bicester experiences congestion hot spots in peak hours. To address transport challenges in Bicester, the Council commits to delivering new strategic highways improvements, including on peripheral routes, improve the connectivity and attractiveness of the active travel network across Bicester, and encourage a shift to more sustainable travel; and
- North West Bicester Eco-Town: a new zero carbon mixed used development, including 6,000 homes, will be developed on land at North West Bicester. The Local Plan's Policy Bicester 1 identifies that improvements are needed to A4095 to facilitate integration of the new development with the town.

2.4.8 The Local Plan seeks to provide for at least 22,840 new homes across the District and identifies several Strategic Development Sites, 13 of which are in Bicester (Figure 3). The main strategic development sites in Bicester include:

- Bicester 1 – North West Bicester Eco-Town: a zero carbon mixed use development including 6,000 homes and 10 ha of employment area. It is expected that 3,293 homes and at least 3,000 jobs will be created by 2031;
- Bicester 2 – Graven Hill: mixed used development of 2,100 dwellings and 26 ha employment area, creating approximately 2,000 jobs;
- Bicester 3 – South West Bicester Phase 2: the second phase of the South West Bicester urban extension (known as Kingsmere) is expected to add an additional 726 homes at the site;
- Bicester 4 – Bicester Business Park: a 29.5 ha site to the south west of Bicester which is allocated to create up to 6,000 jobs of the B1 use class (office);
- Bicester 10 – Bicester Gateway: 18 ha of knowledge economy employment development to the south of Wyvale Garden Centre, creating approximately 3,500 jobs;
- Bicester 11 – Employment Land at North East Bicester: creation of approximately 1,000 jobs on 15 ha area of land to the northeast of Bicester;
- Bicester 12 – South East Bicester: mixed use site for employment and residential development, creating approximately 3,000 jobs and 1,500 homes; and
- Bicester 13 – Gavray Drive: housing site to the east of Bicester town centre, allocated to create 300 dwellings.

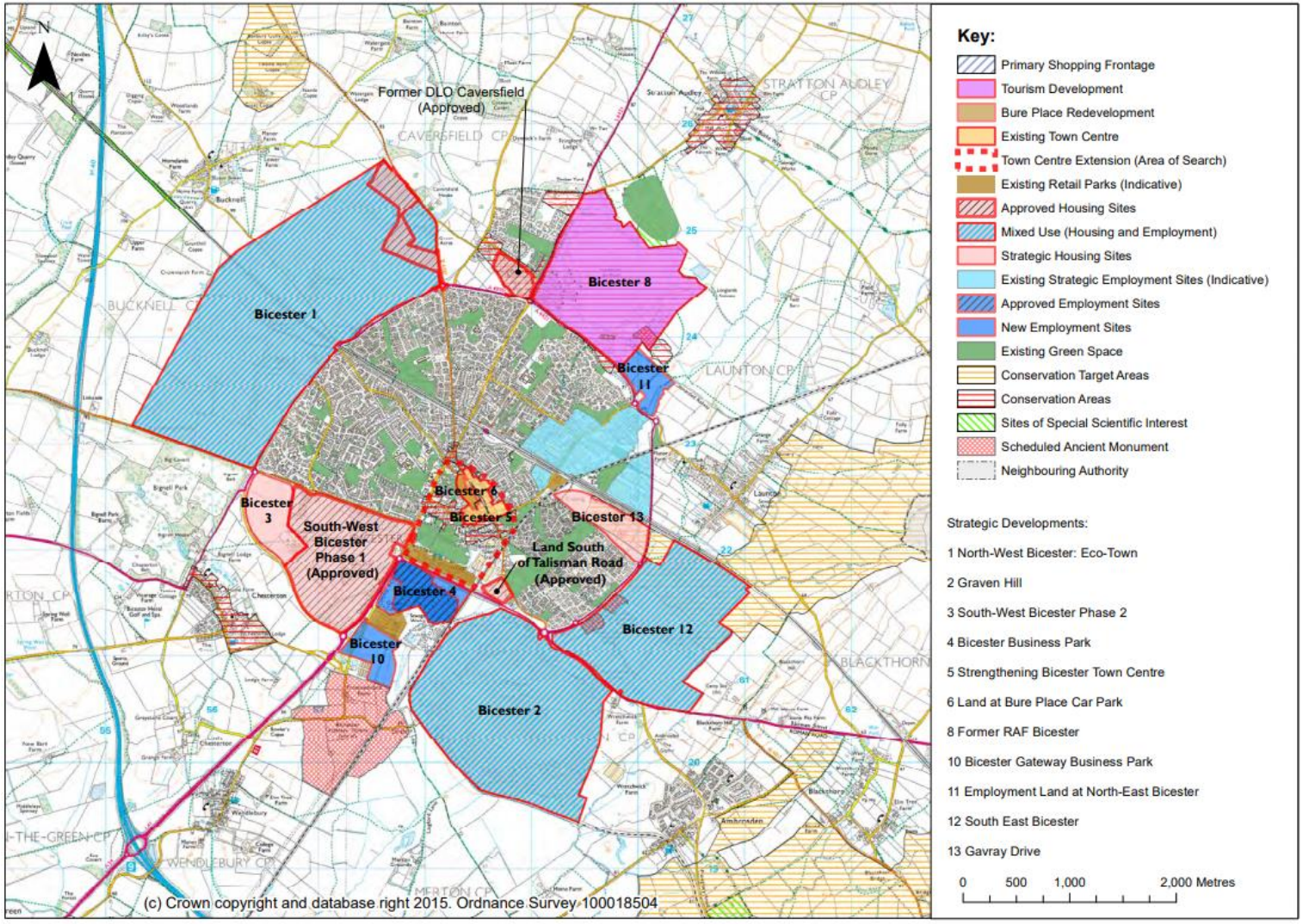

Figure 3. Cherwell District Local Plan – Bicester Development Allocations

Source: Cherwell District Council Local Plan (2011-2031)

2.4.9 The **Bicester Sustainable Transport Strategy**[6] (2015) sets out the strategy for how to meet the growing demand for travel as a result of the planned expansion of Bicester. It draws on the vision for transport in the **Eco Bicester One Shared Vision** (discussed below), aiming to create a transport infrastructure network and transport services that encourages walking and cycling as the first choice for travel within Bicester and through this, and the resulting modal split, to become an exemplar of sustainable movement in the UK. A key target of the Strategy is to double sustainable transport trips within Bicester from around 15,000 in 2015 to 30,000 trips per day in 2031. To achieve this, the Strategy presents measures which will re-balance the priority given to different transport modes, specifically giving more priority to sustainable modes. A range of measures are proposed, including walking and cycling improvements, rail and bus improvements, parking amendments, electric vehicle initiatives, and smarter choice measures.

2.4.10 The **Bicester Local Cycling and Walking Infrastructure Plan**[7] (LCWIP) (2020) is a 10-year plan to improve and increase cycling and walking in the town between 2020 and 2031. It has been developed by Oxfordshire County Council and will form part of Oxfordshire's forthcoming **Local Transport and Connectivity Plan**. The LCWIP sets out the policies and measures to plan for at least a 200% increase in cycling trips and a 50% increase in walking trips within Bicester by 2031. This goal is considered essential to meet, however the LCWIP also sets out more ambitious targets and proposed measures that would require greater levels of commitment, both politically and from the public. In this way, the LCWIP plans for three scenarios in terms of active travel commitment: Comprehensive (Category C), Brave (Category B), and Ambitious (Category A). Key proposed measures under Category C include filling in gaps in the cycle network, introducing 20 mph speed limits in all residential areas and along some radial routes, and improving safety along the Central Corridor. The Plan focuses particularly on internal trips within Bicester, including trips to nearby villages, such as Caversfield, Launton, and Ambrosden.

2.4.11 The **Bicester Movement Study** (2013) reviewed the current and future transport conditions in Bicester and recommended measures to manage expected growth up to 2031, thereby supporting the development of the Bicester Masterplan. The Study identifies that the nature of the A4095 western peripheral route is expected to change with the opening of the south-west link road and the introduction of North West Bicester Eco-Town, predicting a greater potential for delays at junctions and crossings. The **Bicester Masterplan**, as set out in the **Eco Bicester One Shared Vision**[8] (2010), provides the framework for development in Bicester and envisions Bicester to become a more sustainable and pleasant place to live, work and visit. Transitioning to a low carbon community, attracting investment, improving transport, health and leisure choices, and ensuring that infrastructure is managed in an environmentally sustainable way are considered key to achieving the vision. To promote sustainable travel, the Masterplan states that priority should be given to walking, cycling and public transport where possible.

[6] Bicester Sustainable Transport Strategy (Cherwell District Council, 2015)
https://www.cherwell.gov.uk/downloads/download/313/bicester-sustainability-transport-strategy-volume-1-oct-2015
[7] Bicester LCWIP (OCC, 2020)
https://mycouncil.oxfordshire.gov.uk/(S(0aadvdbzab10whnucsifgk2f))/ieDecisionDetails.aspx?Id=8440
[8] Eco Bicester One Shared Vision (https://mycouncil.oxfordshire.gov.uk/documents/s4453/Annex%201.pdf)

2.4.12 The **Healthy New Town Programme**[9] in Bicester aims to '*create a healthy community by making it easy, attractive and affordable for people of all ages to live healthy, sustainable lifestyles and to replicate the learning elsewhere'*. Cherwell District Council is the lead organisation of the programme and by working closely with partners, including schools, businesses, health and care providers, housing developers and academic partners, the programme promotes four workstreams of activities to enable healthy change: built environment, new models of care, community activation, and evaluation. Walking and cycling initiatives across Bicester are included in the programme.

2.4.13 The **North West Bicester Supplementary Planning Document** (2016) sets out the framework and masterplan for the North West Bicester development and will guide forthcoming planning applications. The vision for North West Bicester is to create a new landscape led community which integrates sustainable living and infrastructure with the existing historic town and communities. It is expected that the proposals will take at least 20 years to complete, and that they will help trigger the transition to a low carbon community across Bicester.

2.4.14 Sustainability and connectivity are guiding principles for the North West Bicester development, recognised in the **Sustainable Transport Strategy** for the site. The Strategy draws on best practice from the UK and Europe to inform a Strategy in which promoting active travel and bus use is prioritised. Figure 4 shows the access and movement framework for North West Bicester, highlighting the proposed transport routes for accessing key services at the site, including pedestrian and cyclist routes and bus routes. Sustainability is further embraced in the mode share targets for the development. The masterplan[10] sets the target of achieving an overall modal share of at least 50% of trips to be undertaken by sustainable modes, such as walking, cycling and bus. In addition, at least 35% of trips should be contained within North West Bicester, with 60% of trips to be within Bicester as a whole.

2.4.15 As a result of the North West Bicester development and the A4095 Realignment scheme, the nature of the A4095 is expected to change into a more residential urban environment in the future, for example through a reduction in speeds. However, despite the ambitious mode share targets in favour of sustainable travel, the North West Bicester development is expected to increase congestion across the nearby transport network, creating capacity issues at the A4095 / B4100 Banbury Road roundabout (see Section 3.3).

[9] Bicester Healthy New Town Programme (https://www.england.nhs.uk/ourwork/innovation/healthy-new-towns/demonstrator-sites/eco-bicester/#:~:text=The%20Healthy%20New%20Town%20Programme,health%20and%20to%20replicate%20the)
[10] North West Bicester Supplementary Planning Document (2016)

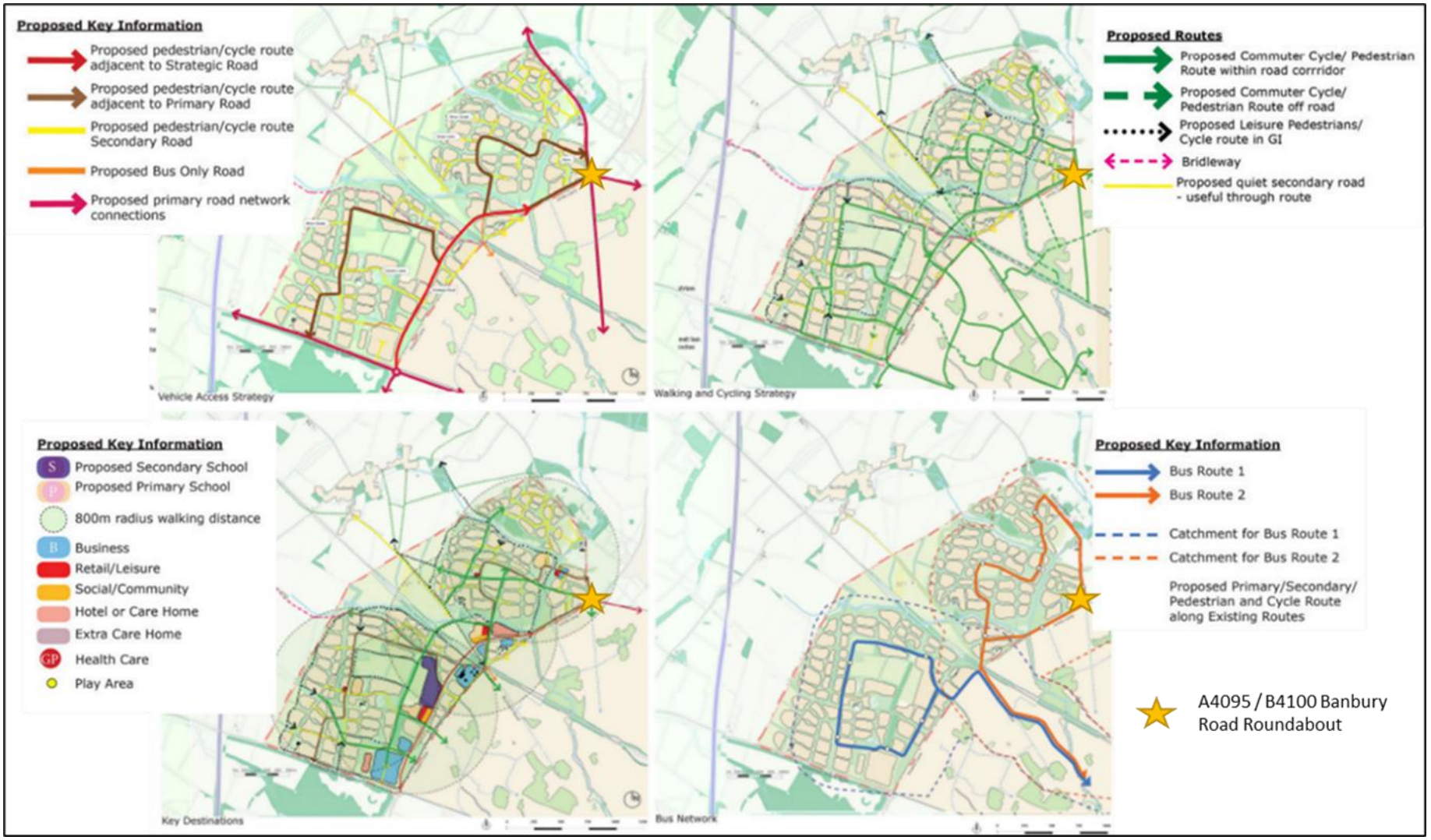

Figure 4. North West Bicester Masterplan – Access and Movement Framework

Source: North West Bicester Supplementary Planning Document (2016)

2.5 Summary

Relevance to the A4095 / B4100 Banbury Road Roundabout Improvement Scheme

Relevant policies relate to delivering homes and jobs, promoting sustainable travel, reducing congestion, improving air quality and health, and promoting road safety. Options considered as part of the Scheme development have taken these policy themes into account.

Overall, across the local, regional and national policies considered, there is expected to be good fit between policy and the Scheme. The Bicester Area Transport Strategy, a supporting document to Oxfordshire County Council's Local Transport Plan 4, states that improvements to the A4095 / B4100 roundabout junction are necessary to accommodate growth aspirations in Bicester, especially to facilitate the North West Bicester development. Cherwell District Council's Local Plan (2011-2031), and the associated Infrastructure Delivery Plan (IDP), include improvements to the A4095 Howes Lane / Lord's Lane as a critical project to deliver within the planning period. The IDP also lists a cycle route across the A4095 / B4100 roundabout junction as a necessary project to promote sustainable travel between North West Bicester and the town centre.

Promotion of active travel is a key policy objective across Bicester and at North West Bicester especially. The Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) sets the target of a 200% increase in cycling trips and a 50% increase in walking trips within Bicester by 2031, based on 2020 levels. Similarly, the North West Bicester Supplementary Planning Document, and the associated Sustainable Transport Strategy for the site, sets ambitious mode share targets, aiming to achieve for at least 50% of trips to be undertaken by sustainable modes, such as walking, cycling and bus use. By improving facilities for pedestrians and cyclists, the Scheme contributes to achieving these policy goals.

Going forward, the nature of the A4095 is expected to change. The A4095 Realignment scheme as well as the North West Bicester development are likely to change the character of the A4095, so it becomes a more urban and residential road, for example through a reduction in speed limits. The Scheme has been developed with the future vision of the A4095 in mind.

3 Current and Future Context

3.1 Introduction

3.1.1 This chapter reviews previous work conducted in order to identify key challenges in the study area, which would help develop the project objectives and, subsequently, a suitable scheme to meet those objectives. Initial work had been undertaken by OCC to develop an understanding of whether there is a need for intervention. Further analysis has been undertaken to build on this initial work, specifically in developing the project objectives and generating and appraising options that would be likely to meet the objectives.

3.2 Study Area

3.2.1 The study area for the Scheme contains the A4095 / B4100 Banbury Road roundabout and its immediate surroundings, as shown in Figure 5. This does not mean that potential impacts which occur outside this area have not been considered. Some interventions identified through the option generation and appraisal process provide linkages beyond this proposed study area and create benefits outside it, such as walking and cycling provision that connects to the wider town network. These potential impacts have been identified and assessed as part of the option appraisal process.

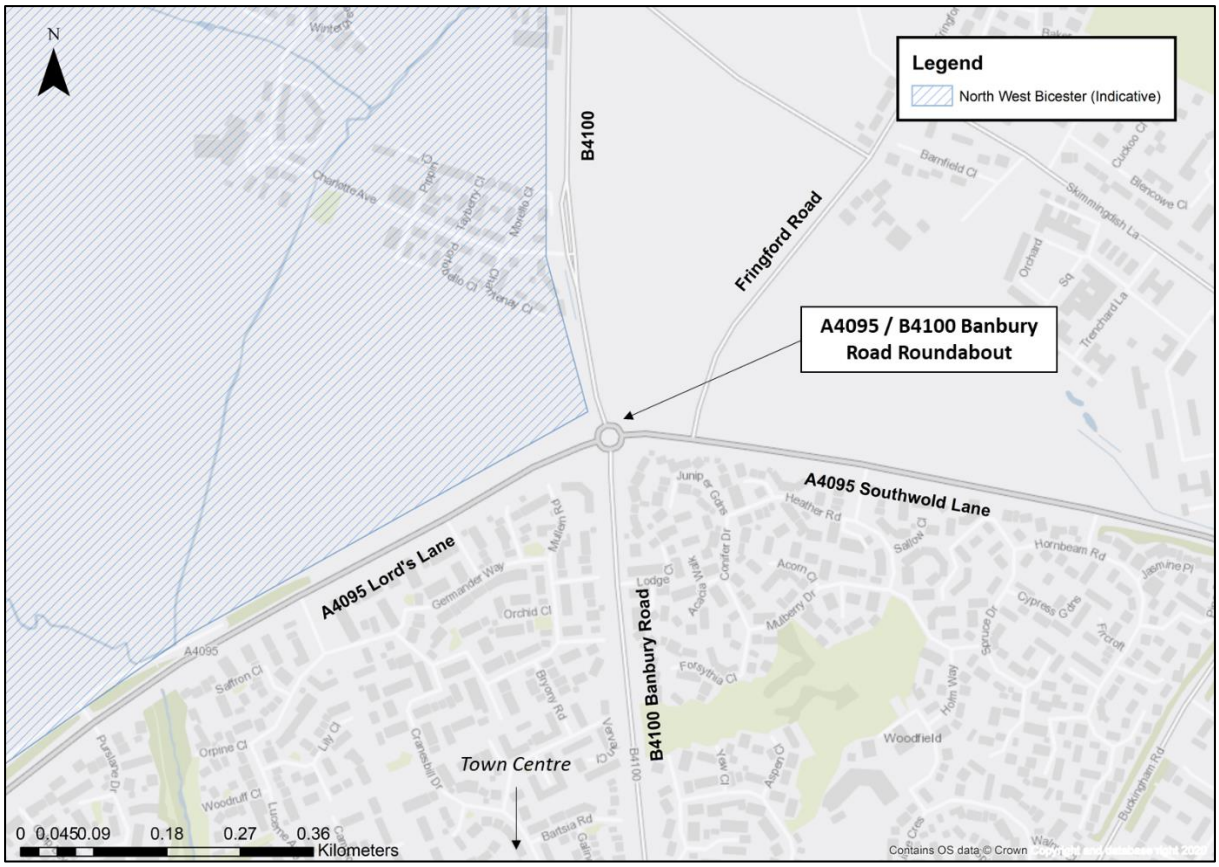

Figure 5. Study Area

Source: AECOM @ Crown copyright and database right 2021

3.3 Current and Future Conditions

3.3.1 As part of the initial stage of option development, it is important to understand the current and future context in the study area.

3.3.2 The local context and, where appropriate, current and future trends for the following are discussed in this section:

- Current socio-economic context;
- Future growth of Bicester (housing);
- Key existing transport provision and conditions
  - Highways and public transport infrastructure;
  - Cycle routes and public rights of way;
  - Travel patterns and modal share;
  - Traffic flows and congestion issues;
  - Collisions on the highway network; and
- Environmental conditions.

Socio-economic context

3.3.3 Selected socio-economic indicators are presented in Table 2. Cherwell district has a population of 150,500, constituting approximately 22% of Oxfordshire's population.

3.3.4 The district has higher levels of employment compared to the averages in Oxfordshire, the South East and England. The ratio of jobs to population (aged 16 to 64) is 1.02, which is significantly higher than the employment opportunities provided in the region and England as a whole.

3.3.5 While the proportion of the population with qualifications at NVQ4 (Honours degree equivalent) and above is slightly lower than the average in Oxfordshire, it is higher than the averages in the region and England.

3.3.6 Weekly pay in Cherwell is approximately 4% higher than the England average. However, house prices are approximately 12% higher than the England average, although lower than both the county and region averages.

Table 2. Socio-economic Metrics

Metrics*		Cherwell	Oxfordshire	South East	England
Population (2019)	All people	150,500	691,700	9,180,100	56,287,000
	Population aged 16-64	61.7%	62.5%	61.2%	62.4%
	Qualifications at NVQ4 and above	44.4%	50.9%	43.4%	40.0%
Employment (Jan – Dec 2019)	Economically active – in employment	86%	83.4%	79.5%	76%
	Economically active – unemployed	NA	1.1%	3.1%	4%
	Economic inactivity**	14%	15.7%	18%	20.8%
	Part time proportion	32.9%	32.3%	33.2%	32.0%
Job Density (2019)	Ratio jobs: population aged 16-64	1.02	1.04	0.90	0.88
Employee Jobs (2019)	The 2 largest employment sectors	23.2% Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	15.7% Human Health and Social Work Activities	16.4% Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	15.2% Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
		12.2% Administrative and Support Service Activities	14.7% Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	12.9% Human Health and Social Work Activities	12.7% Human Health and Social Work Activities
Gross Weekly Median Pay (by residence) (2019)	Full-time workers	£616.6	£655.1	£636.3	£592.1
	Ratio compared to England	1.04	1.11	1.07	1.00
House Prices	Average house price (Jan 2020)***	£233,540	£291,400	£257,528	£207,924
	Ratio compared to England	1.12	1.40	1.24	1.00

** Source: NOMIS, unless otherwise stated*
*** Student, looking after family/ home, Sick, Discouraged, Retired, Other*
**** Source: UK House Price Index: Average price for first-time buyers*

3.3.7 Figure 6 shows the indices of Multiple Deprivation at Lower Level Super Output Area (LSOA) in and around Bicester. The map visualises relative deprivation, ranking each LSOA in England. Deprivation is typified by low rates of income, employment, educational attainment, access to housing, and high rates of crime. Bicester contains a sharp contrast of neighbourhoods which are rated as some of the most and least deprived nationally: areas in the southwest are categorised as some of the most deprived, whereas areas in the north and southeast are among the least deprived.

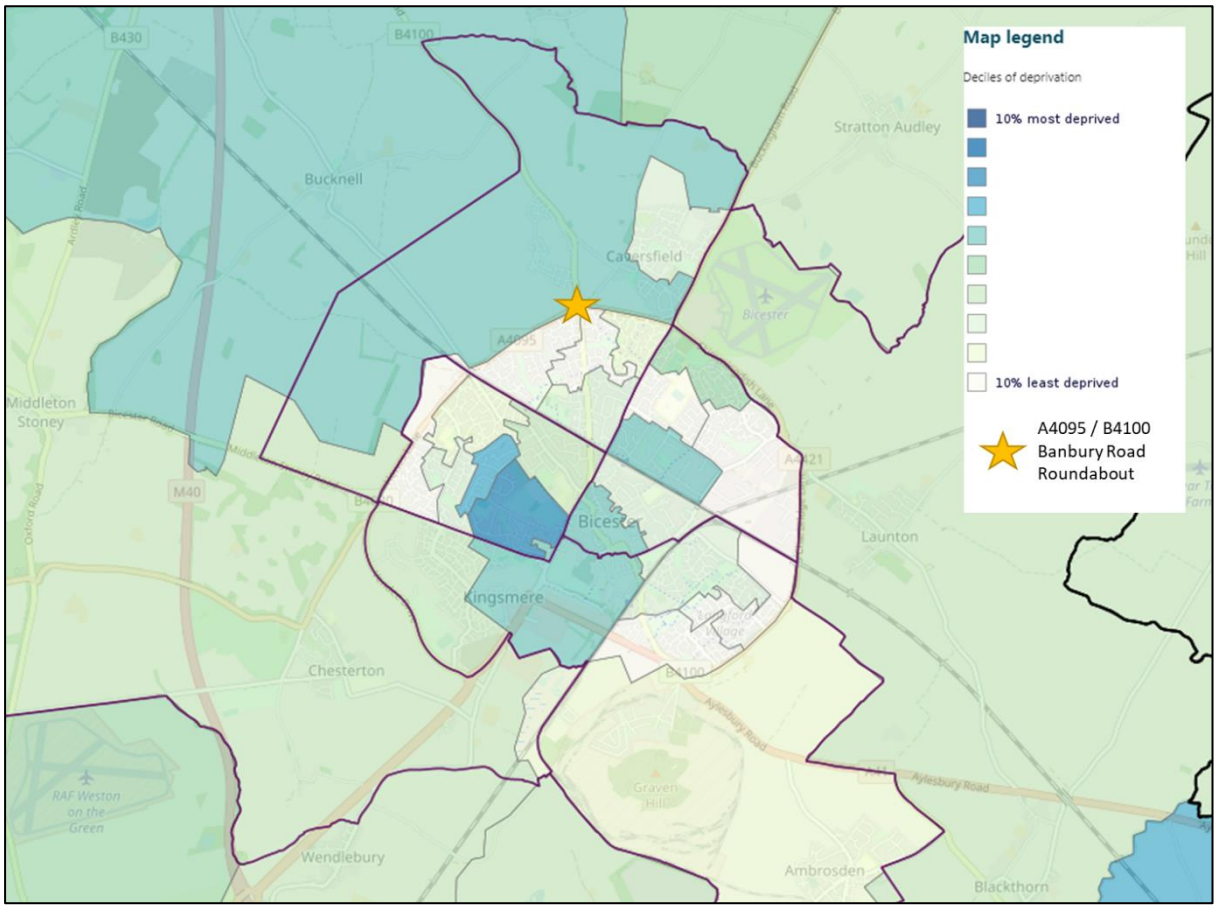

Figure 6. Indices of Multiple Deprivation

Source: Ministry of Housing, Communities & Local Government (2019)

Future growth

3.3.8 The population in Cherwell District is expected to grow in the future. The Cherwell District Local Plan 2011-2031 (2015) commits to delivering 22,840 new homes between 2011-2031, the equivalent of 1,142 homes per year. Around half of this housing growth will be provided in Bicester, where 10,129 homes are committed to be delivered by 2031, in addition to 138.5 hectares of employment land. As a result of the rapid expansion in housing and employment, the population in Bicester is forecast to be around 55,000 by 2034[11].

3.3.9 A significant proportion of the committed homes in Bicester are allocated to the North West Bicester Eco-Town development ('Bicester 1' policy in the Local Plan). North West Bicester is identified as a Strategic Development Site in the Local Plan, expected to deliver a total of 3,293 homes and 3,000 jobs by 2031. An additional 2,707 homes and 1,600 jobs are expected beyond 2031, creating a total of 6,000 committed homes and 4,600 jobs[12] at the site.

Existing Highways and Public Transport Infrastructure

3.3.10 Figure 7 shows the road and rail network in Bicester. The town is surrounded by single carriageway perimeter A roads, starting with the A4095 in the southwest, which turns into the A4421 as it joins the ring road at the A4095 / Buckingham Road / A4421 junction in the north east of Bicester. In the south of Bicester, the A4095 and the A4421

[11] Bicester Local Cycling and Walking Infrastructure Plan (OCC, 2020) https://mycouncil.oxfordshire.gov.uk/(S(0aadvdbzab10whnucsifgk2f))/ieDecisionDetails.aspx?Id=8440
[12] North West Bicester Supplementary Planning Document (2016)

are joined by the B4030 and the A41. The A41 connects with M40 Junction 9 further south of Bicester, providing links to Banbury and Birmingham in the north and London in the south. The A41 also links Bicester with Oxford and other towns in the southwest of Oxfordshire.

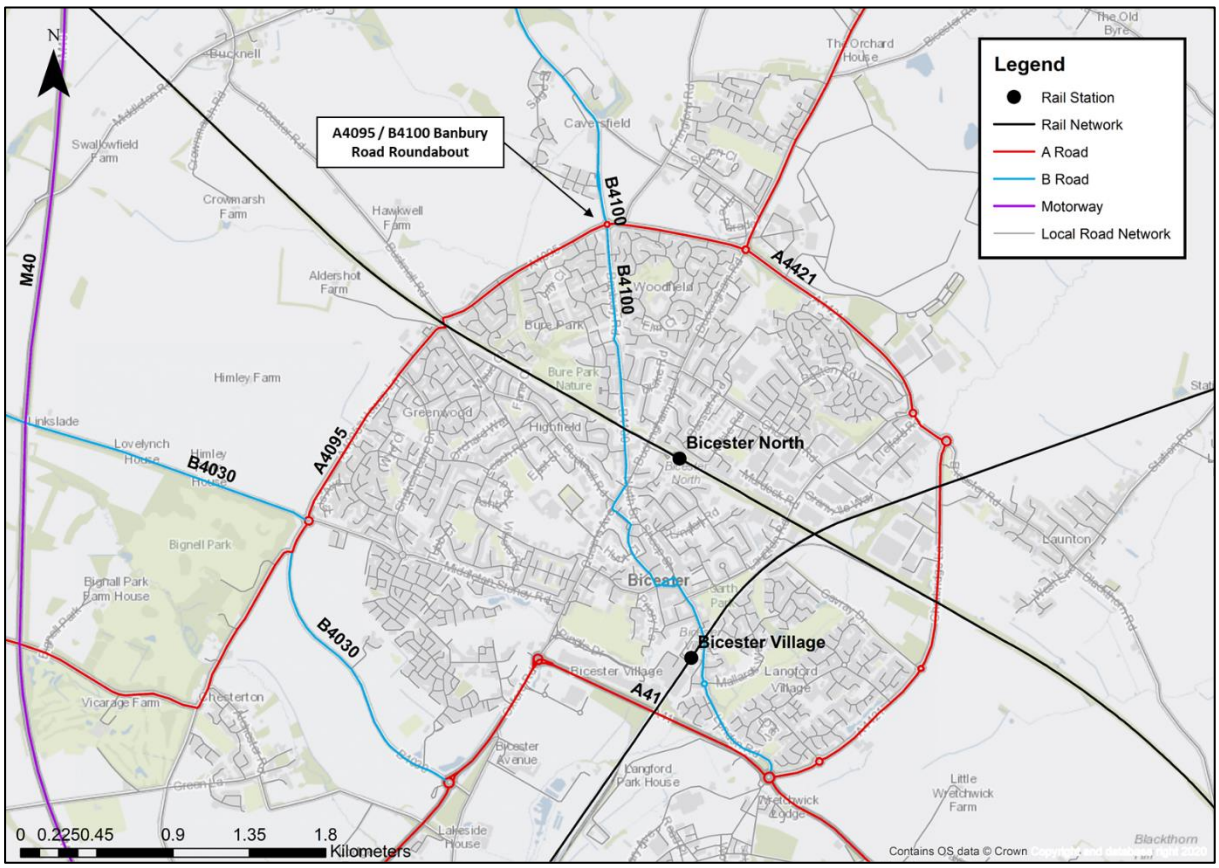

Figure 7. Road and Rail Network

Source: AECOM @ Crown copyright and database right 2021

3.3.11 Table 3 outlines the characteristics of the A4095 / B4100 Banbury Road roundabout, and the surrounding road network, including details of carriageways and footways.

Table 3. A4095 / B4100 Banbury Road Roundabout – Road Network Information

Road	Speed Limit (mph)	Single/Dual	Footways/Cycle
A4095 / B4100 roundabout	50	Two lane circulatory	Off-road (a dedicated path provided off the carriageway) shared use path around the roundabout.
A4095 Lords Lane (western approach)	50	Single	Off-road shared use path on the southern side of the carriageway. Signalised crossing 55 meters from the roundabout.
B4100 (northern approach)	40	Single	Off-road shared use path on the western side of the carriageway from the roundabout until the Exemplar site access. Signalised crossing 80 metres from the roundabout. Shared use path on the eastern side of the carriageway from signalised crossing until roundabout.
A4095 (eastern approach)	50	Single	Off-road shared use path on the southern side of the carriageway. Signalised crossing 110 metres from the roundabout and informal crossing at the roundabout entry/exit.
B4100 Banbury Road (southern approach)	40	Single	Off-road shared use path on the western side of the carriageway. Informal crossing at the roundabout entry/exit.

3.3.12 The A4095 Realignment scheme is a key scheme coming forward near the study area. Phase 1 of the scheme involves the provision of two underpasses, one for motorised traffic and one for pedestrian and cyclists, to the railway line near the Howes Lane / Bucknell Road junction. This phase is expected to be completed in July 2021. Phase 2 of the scheme is currently under feasibility assessment and involves the realignment of Howes Lane between Middleton Stoney Road roundabout to approximately 500 metres from the A4095 / B4100 Banbury Road roundabout, including segregated provision for pedestrians and cyclists. This phase is expected to be completed in 2024.

3.3.13 As a result of the A4095 Realignment scheme and the North West Bicester development, the nature of the A4095 is expected to change into a more residential urban environment in the future, for example through a reduction in speeds.

3.3.14 As seen in Figure 7, there are two rail stations in Bicester – Bicester North and Bicester Village – both of which are served by Chiltern Railways and connect to London. The Oxford – London service connects Bicester Village with Oxford and London Marylebone. Using this service, it takes just over 1 hour to travel between Bicester and London Marylebone in the weekday morning peak hours. Conversely, it takes around 20 minutes to travel from Bicester to Oxford using this service. Two services connect with Bicester North station. One is the Kidderminster – London service and the other the Banbury – London service. Using these services, it takes between 50 minutes and 1 hour 15 minutes to travel between Bicester and London Marylebone. Both services allow for interchanges at Banbury, where connections to Stratford-upon-Avon and Birmingham are available.

3.3.15 Phase 1 of the East-West Rail scheme, which was completed in 2016, involved connecting Oxford, via Bicester Village, to the Chiltern Main Line. Phase 2 of the scheme includes extending the Oxford – London service, via Bicester Village, to Bletchley, Milton Keynes, Bedford and potentially Cambridge.

3.3.16 Bicester's bus services are operated by Stagecoach, as demonstrated in Figure 8, and Grayline. There are several local services which serve neighbourhoods in Bicester, such as the 26 and 27 services. The main inter-urban services are:

- 505 service between Bicester and Brackley, discussed further below;
- X5 service between Oxford[13] and Bedford, via Bicester and Milton Keynes (approximately one service per hour). Using this service, it takes just under 1 hr 10 minutes to travel between Bicester and Milton Keynes;
- S5 service between Oxford and Bicester (up to four services per hour in the peak periods). Using this service, it takes approximately 45 minutes to travel between Bicester and Oxford in the weekday morning peak hours; and
- H5 service between Headington and Bicester, via Ambrosden and Islip (approximately two services per hour in the peak periods). Using this service, it takes approximately 45 minutes to travel between Bicester and Headington in the weekday morning peak hours.

[13] At the time of writing, the X5 service between Milton Keynes and Oxford has been withdrawn as a result of the national lockdown travel restrictions in light of the Covid-19 pandemic. However, the service still runs between Bicester and Bedford.

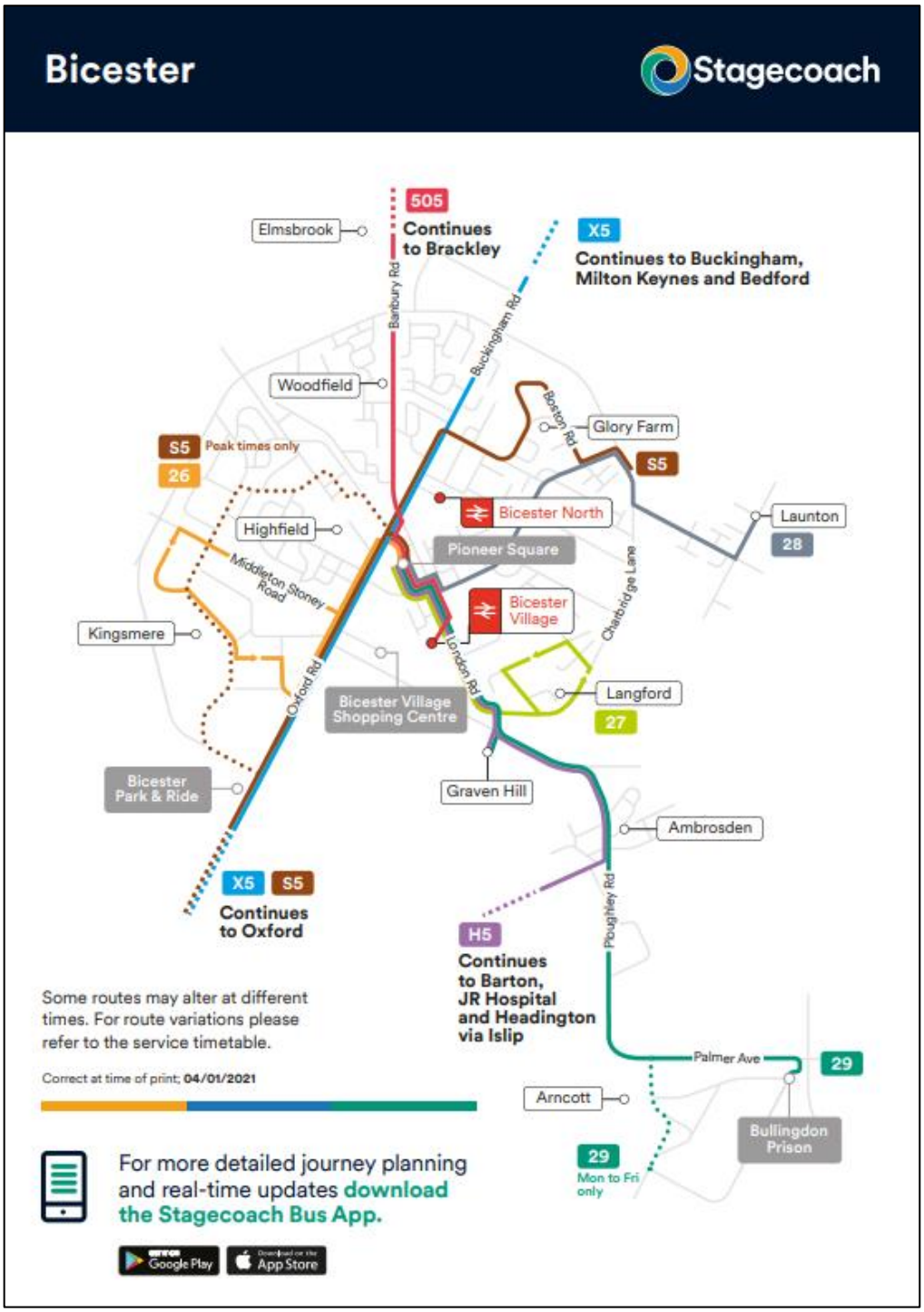

Figure 8. Stagecoach Bus Services

Source: Stagecoach (2021)[14]

3.3.17 Two bus services pass through the A4095 / B4100 Banbury Road roundabout:

- Stagecoach's 505 service which runs between Bicester and Brackley (approximately one service per hour throughout the day). This service stops at Banbury Road roundabout (just south of the roundabout on Banbury Road) and at the Exemplar site at North West Bicester; and
- Grayline's E1 Ecotown service which runs between Elmsbrook (thereby serving the North West Bicester site) and the Town Centre, including Bicester Town

[14] Bicester Megarider Map (Stagecoach, 2021) https://tiscon-maps-stagecoachbus.s3.amazonaws.com/ZoneMaps/Oxford/Bicester%20megarider%20map.pdf

Village station. This service also stops at Banbury Road roundabout and the Exemplar site, and runs on Fringford Road to serve Caversfield

3.3.18 The study area is served by four bus stops: two approximately 80 metres south of the A4095 / B4100 Banbury Road roundabout, and two on the B4100 by the Exemplar site. The northbound bus stop by the Exemplar site contains a bus layby and seating facilities, whereas the other three require buses to stop on the carriageway. The southbound bus stop at the Exemplar site and the northbound bus stop south of the A4095 / B4100 Banbury Road roundabout are not served by footways and thereby require pedestrians to wait next to the carriageway.

3.3.19 At the time of writing, there are no expected changes to the bus service provision in the study area. However, it is expected that future buses serving North West Bicester and passing through the Scheme will take the following route: along Banbury Road northbound onto the B4100, thereafter travelling through the North West Bicester development and out along A4095 Howes Lane eastbound, to then travel southbound toward Bicester Town via Banbury Road southbound

Pedestrian and Cycle Infrastructure Provision, and Use

3.3.20 Figure 9 outlines the existing cycle network across Bicester, including potential routes (in green) proposed in the Bicester Local Cycling and Walking Infrastructure Plan[15] (LCWIP) (2020).

3.3.21 Active travel infrastructure is available in most parts of the town and primarily provided via off-road shared use paths, with key off-road routes provided along the majority of the ring road and some of the radial routes into town, most notably parallel to the B4100 Banbury Road.

3.3.22 National Cycle Network 51 passes through the south-eastern parts of the town, linking Launton village, Gavray Drive, Tubbs Crossing, Sheep Street, Bicester Village and Wendlebury.

[15] Bicester LCWIP (OCC, 2020)
https://mycouncil.oxfordshire.gov.uk/(S(0aadvdbzab10whnucsifgk2f))/ieDecisionDetails.aspx?Id=8440

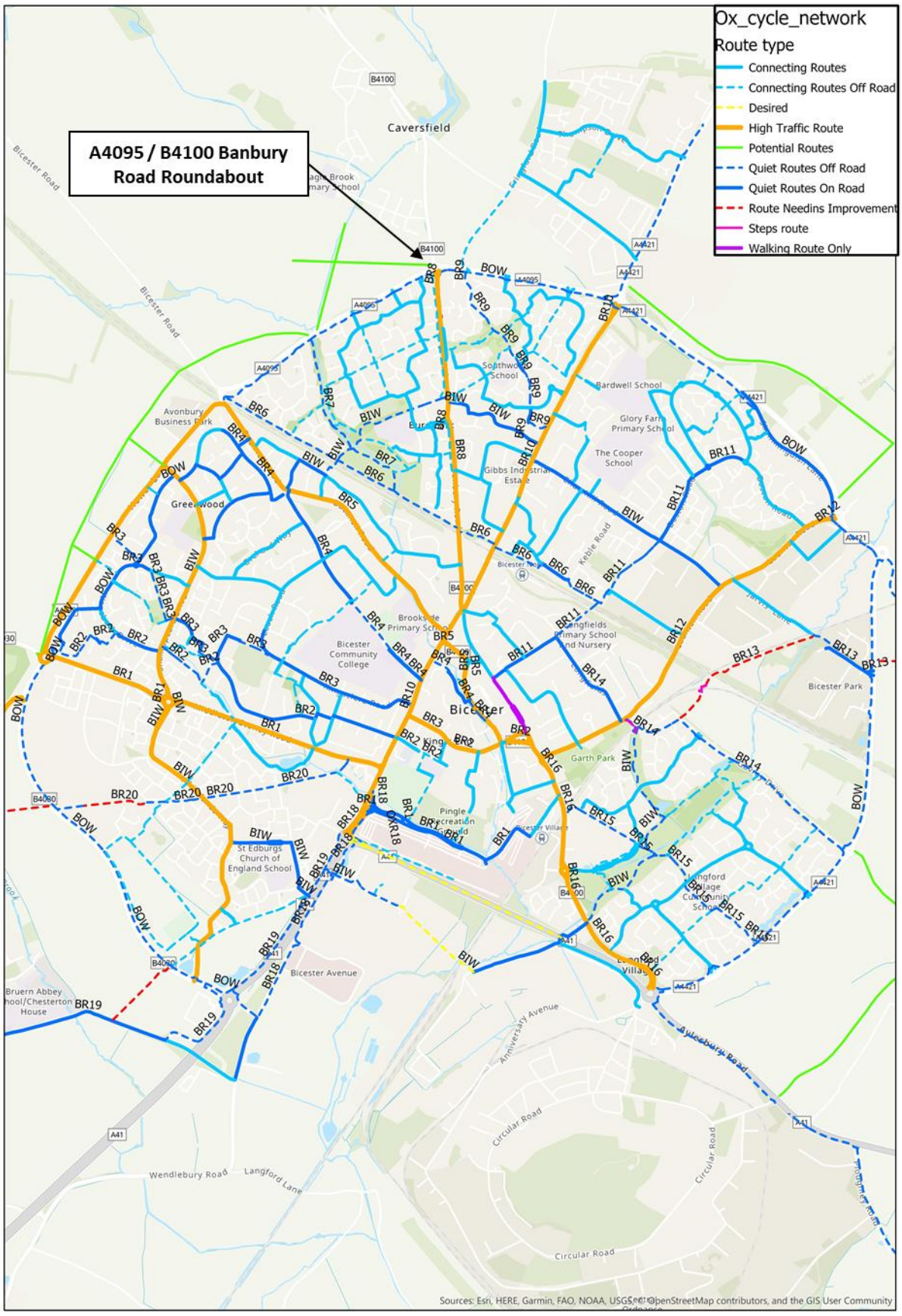

Figure 9. Cycle Network

Source: Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) (2020)

3.3.23 The existing cycle network near the A4095 / B4100 Banbury Road roundabout is provided in more detail in Figure 10.

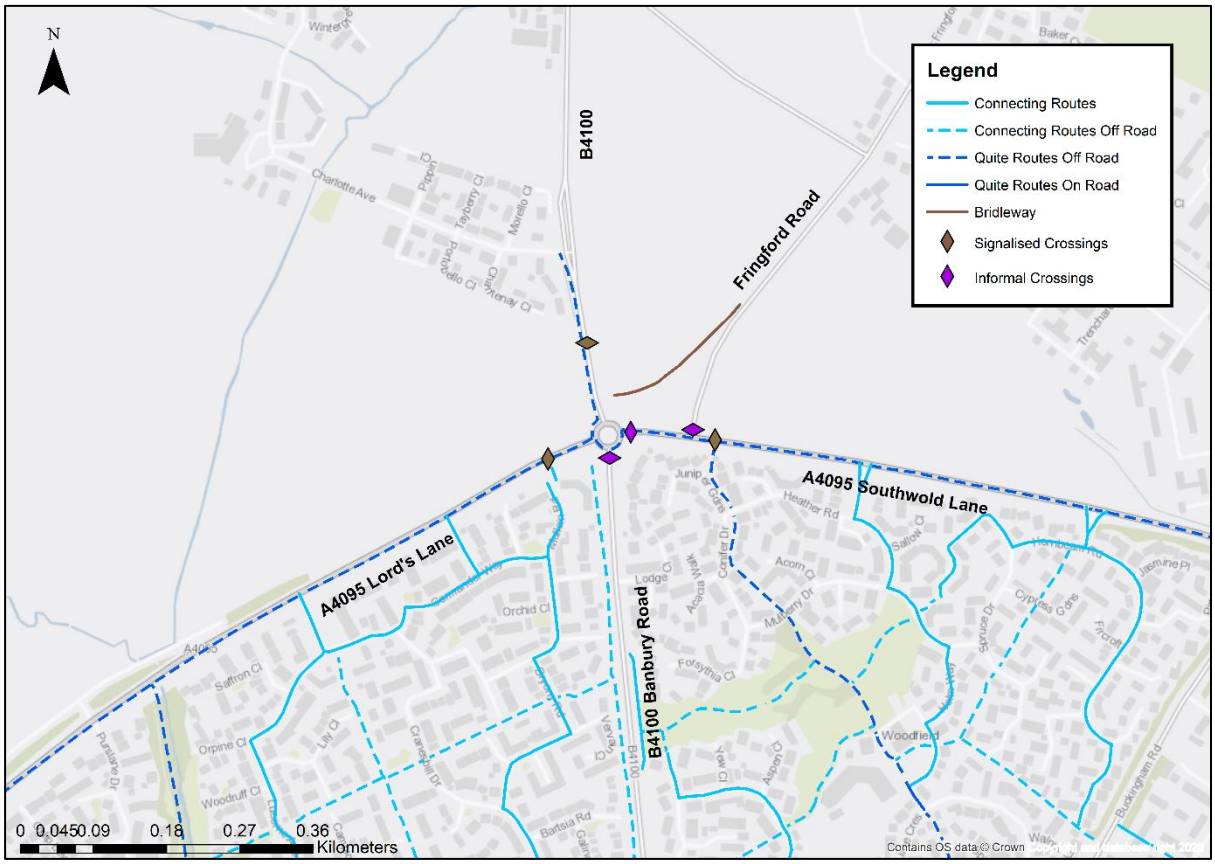

Figure 10. Cycle Network – A4095 / B4100 Banbury Road Roundabout

Source: Oxfordshire County Council; AECOM @ Crown copyright and database right 2021

3.3.24 Figure 11 overleaf provides views of the existing active travel provision at the A4095 / B4100 Banbury Road roundabout, including:

- Top left: Signalised crossing on A4095 west of the roundabout, including shared use paths on both sides of the road;
- Top right: B4100 just north of the roundabout, showing the shared use paths on the left- and right-hand side of the road, including access to the bridleway to the right;
- Bottom right: Signalised crossing on A4095 east of the roundabout, just after Fringford Road. Shared use path on the right-hand side of the road connecting to the bridleway; and
- Bottom left: Informal crossing on Banbury Road just south of the roundabout, including shared use path on the left-hand side and a footpath on the right side.

Figure 11. Active Travel Provision – A4095 / B4100 Roundabout

Source: Google Earth Pro™ imagery in the form of Google Map™ and Google Streetview™ have been used, unmodified, within this document. This imagery has been used within the extents of the AECOM license agreement with Google

3.3.25 In 2011, travel surveys of Bicester residents and four adjoining villages were undertaken to provide a representative picture of day to day travel patterns (LCWIP, 2020). A total of 2,097 people were surveyed. The data provides a detailed picture of travel patterns in Bicester.

3.3.26 In terms of walking and cycling, only 2% of trips to and from Bicester were by walk or cycle, whereas 40% of trips internal to Bicester were undertaken by active modes. Out of the 53,200 surveyed internal trips, 34% (18,000) of the trips were on foot and 6% (3,200) by cycle. However, the data indicate a significantly higher potential for walking and cycling within Bicester. Table 4 shows that a significant proportion of short trips, trips between 1-5 km, are currently undertaken by car. Given the length of these trips, there is an opportunity to see a significantly higher proportion of active mode use for all trips under 5 km.

Table 4. Mode Share of Internal Trips by Distance (2011 Data)

Distance	Walk	Cycle	Walk and Cycle	Car	Public Transport
All internal trips	34%	6%	40%	58%	2%
1-3 km	30%	8%	38%	60%	-
3-5 km	-*	-	11%	85%	-

Source: Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) (2020)
**No data available for these segments in the LCWIP*

3.3.27 Given the contained nature of Bicester, most destinations are easily reached by walk or cycle. Figure 12 shows the walking and cycling accessibility in Bicester, measured as travel time from the town centre. While the study area is more than 30 minutes by walk from the town centre, the town centre can be reached by only a 10 minutes cycle ride. The compact nature of Bicester and the large proportion of local trips indicate the potential for more trips to be made by foot or cycle. By improving pedestrian and cycle facilities, the Scheme can help realise these trips.

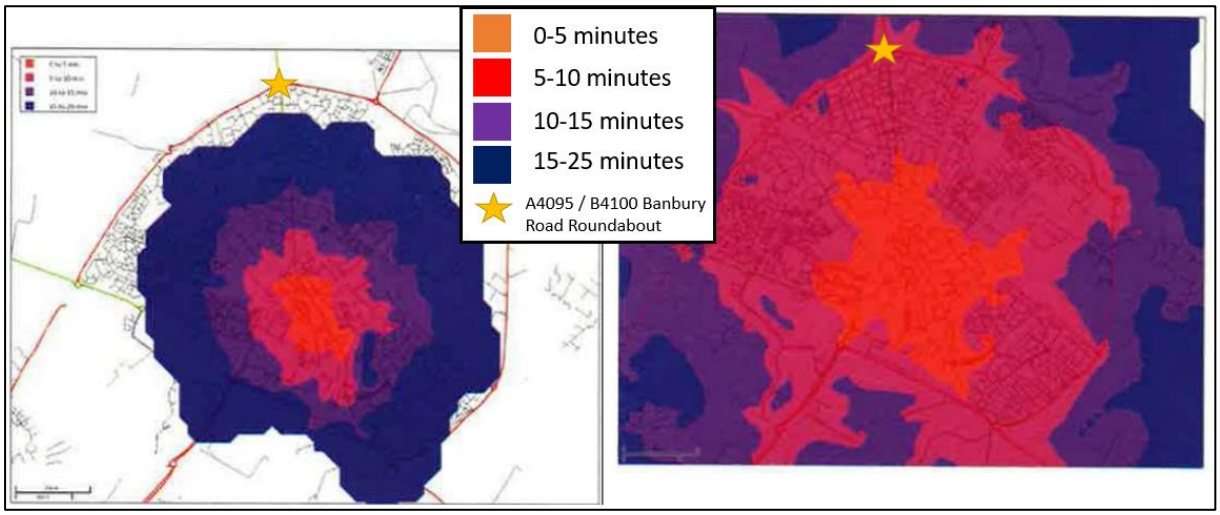

Figure 12. Walking (left) and Cycling (right) Accessibility

Source: Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) (2020)

3.3.28 The Propensity to Cycle Tool (PCT) has been used to demonstrate how the cycling commuting demand is spread out over Bicester and particularly in the study area. It should be noted that the tool is based on 2011 Census journey to work data. Figure 13 shows that the PCT estimate of cycle commuting demand aligns well with the 2011 travel survey data indicating that 6% of internal trips in Bicester are by cycle.

3.3.29 However, cycle commuting demand is lower in the study area, between 0-3%. This is to be expected, given that, at present, there are few residential, retail, leisure or employment areas northwest of Bicester. This is further supported by the origin-destination desire lines (the top 50 origin-destination desire lines are visualised in Figure 13): there are no desire lines indicating travel by cycle north of Bicester, with most desire lines contained within the town. However, the land uses in the study area will change significantly once the North West Bicester site is developed. North West Bicester will include housing, employment, retail and leisure, and will therefore create an incentive and need to travel to and from the site.

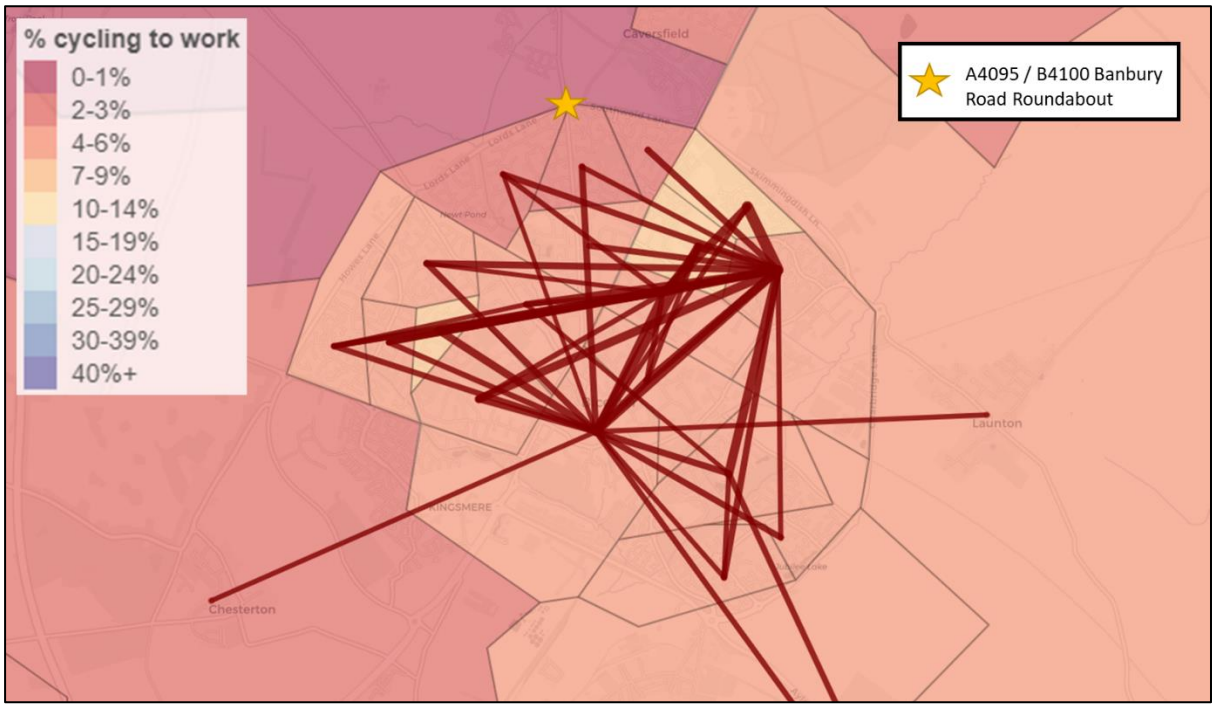

Figure 13. Census 2011 Cycle to Work Demand (LSOA Level)

Source: Propensity to Cycle Tool

3.3.30 Analysis undertaken for the Bicester Sustainable Transport Strategy (2015) forecasts a 9% increase in the use of sustainable modes by Bicester residents, from 31% of all trips by Bicester residents being undertaken by sustainable modes in 2014 to 40% of trips in 2031. This includes trips by walk and cycle, but also other sustainable modes such as bus. The analysis assumes that measures are implemented which ensure this ambitious mode shift becomes a reality, thereby emphasising the importance of infrastructure improvements to support active mode uptake.

3.3.31 The same analysis calculates that 59% of trips in 2031 (93,000 trips out of a total of 153,000 trips) will be internal (within Bicester). Given the contained nature of Bicester town, a significant proportion of the internal trips has the potential to be walkable and cyclable; based on the walking and cycling accessibility maps in Figure 12, a trip can be considered to be walkable and cyclable if it takes up to 25 minutes and 15 minutes, respectively.

3.3.32 Sustainable travel policy targets in Bicester present another source of information regarding predicted future walking and cycling demand. The LWCIP sets the target of increasing the number of local cycling trips in Bicester from 3,000 trips in 2014 to at least 9,000 trips in 2031. The LWCIP emphasises the need to improve the provision for pedestrians and cyclists to encourage sustainable mode shift.

3.3.33 The PCT can also be used to demonstrate potential cycle demand under different scenarios. Figure 14 demonstrates the potential cycle commuting demand in Bicester in the “Go Dutch” scenario (the propensity to cycle assuming the area had the same infrastructure and cycling culture as the Netherlands, taking account of the topography and commute distance patterns). Under the Go-Dutch scenario, cycle commuting demand significantly increases in Bicester (and the study area) to a level of 15-29%. The PCT does not account for forecast growth and planned developments, and so the potential levels of cycling commuting demand in the study area under this Go-Dutch scenario may be even higher given the ambitious mode share targets / sustainability principles and likely improvements of cycle infrastructure proposed at North West Bicester. The PCT demonstrates that there is considerable potential to realise

significant increases in cycle to work if infrastructure is improved and cycling becomes more normalised. It should be noted that the PCT only focuses on commuting trips and that similar potential for increases in cycling could be possible for other trip purposes. Given the improvements to pedestrian and cyclist facilities included in the Scheme, it could help realise this cycling potential.

3.3.34 The aforementioned analysis of current and forecast walking and cycling demand in Bicester demonstrates a significant potential for increased travel by walking and cycling. To support an uptake in active mode use, the analysis has emphasised the importance of infrastructure improvements for pedestrians and cyclists. By improving facilities for pedestrians and cyclists, the Scheme could help realise this potential, both across Bicester as a whole and in the study area.

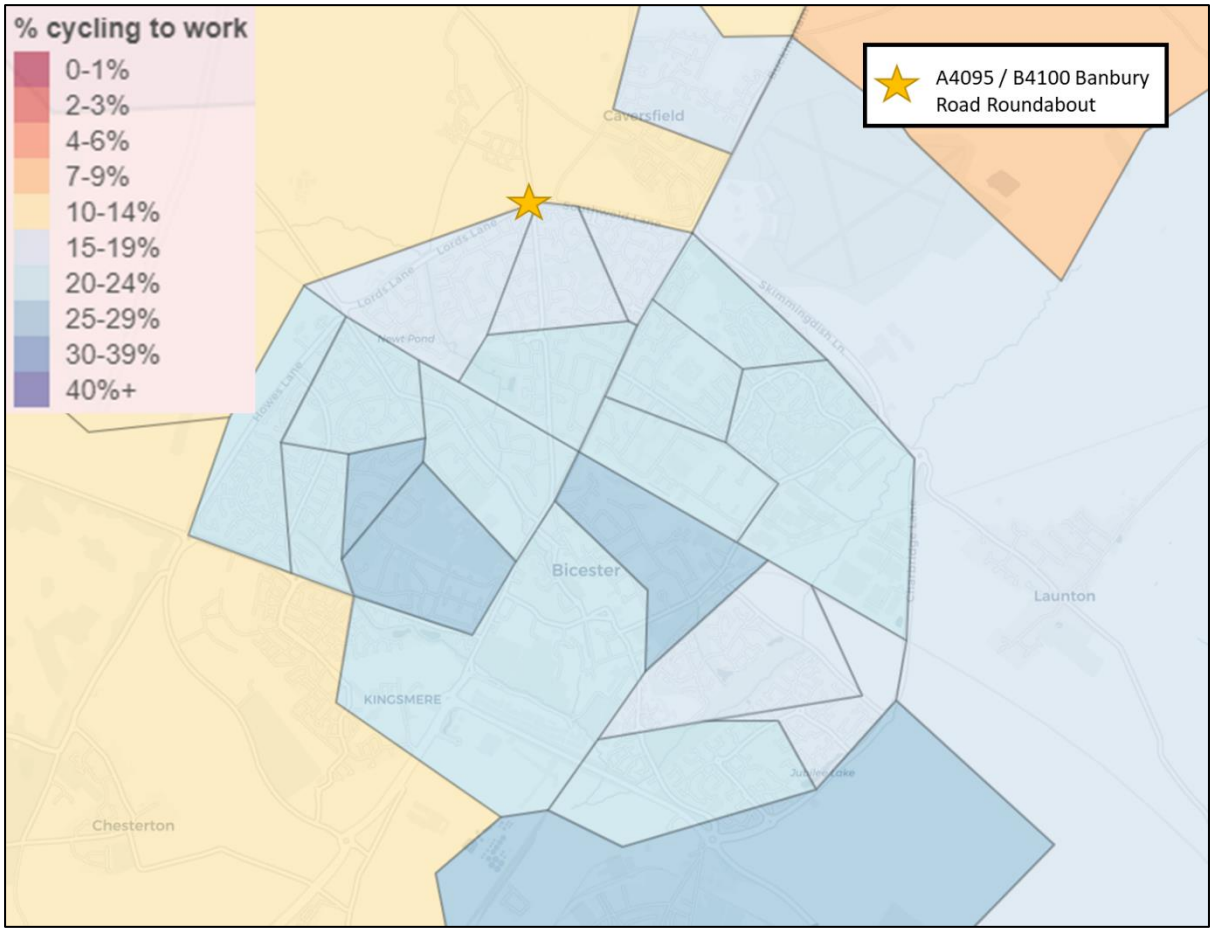

Figure 14. Potential Cycle to Work Demand: Go Dutch Scenario (LSOA Level)

Source: The Propensity to Cycle Tool

3.3.35 There are some public rights of way routes in Bicester, specifically footpaths and bridleways (Figure 15). Out of these routes, only one connects with the study area: the bridleway running parallel along Fringford Road and connecting with the B4100 just north of the A4095 / B4100 Banbury Road roundabout. It should be noted that public rights of way do not include paved paths for pedestrians and cyclists, such as the shared use paths in the study area.

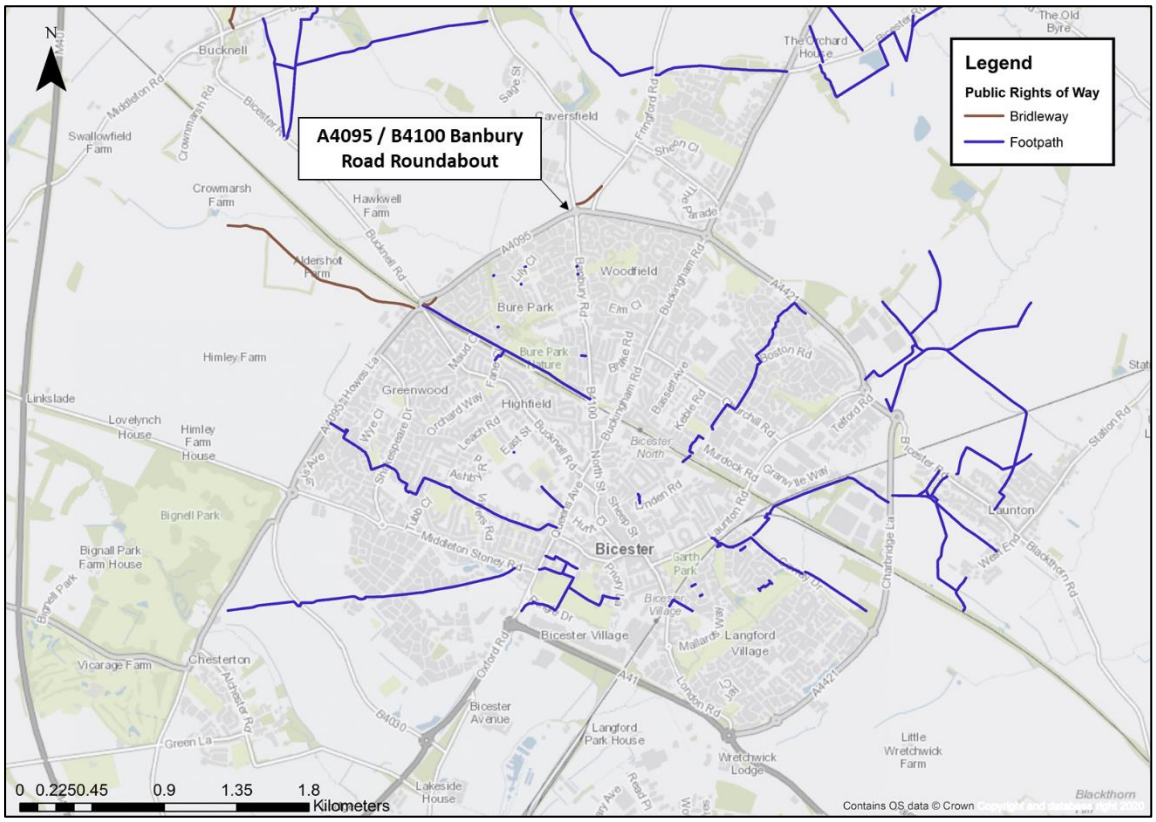

Figure 15. Public Rights of Way

Source: Oxfordshire County Council; AECOM @ Crown copyright and database right 2021

Travel Patterns and Modal Share

3.3.36 Table 5 shows the modal share of commuting trips by Bicester residents, based on 2011 Census data.[16]

3.3.37 The modal share of internal commuting trips aligns well with the 2011 travel survey data discussed above. Based on the Census data, the majority of internal trips (57%) are done by car, whereas 40% are by active modes. The share of car commuting trips increases significantly for external trips, reaching 82% of trips. In total, about 5% of Bicester residents cycle to work, whereas 12% walk to work. This is in line with the walking and cycling percentages for Cherwell as a whole (4% bicycle and 13% pedestrian) and for England (3% bicycle and 12% pedestrian).

3.3.38 The data shows that 55% of Bicester residents work within Cherwell, 17% work in Oxford and 35% live and work within Bicester. In total, 14,942 commuting trips were produced from Bicester.

[16] Though now relatively out of date, the 2011 Census data provides a statistically representative picture of travel patterns. Together with the additional 2011 travel survey data, it is the best available source of information on travel patterns and modal share.

Table 5. Journey to Work – Bicester Residents

Travel Mode	Place of Work Within Bicester		Outside Bicester		Total	%
Rail	12	0%	499	5%	511	3%
Bus	84	2%	613	6%	697	5%
Car	2,983	57%	8,018	82%	11,001	73%
Bicycle	576	11%	169	2%	745	5%
On foot	1,529	29%	274	3%	1,803	12%
Other method of travel to work	68	1%	179	2%	247	2%
Total	5,252		9,752		15,004	
%	35%		65%		100%	

Source: Census 2011

3.3.39 Figure 16 shows the main commuter flows within Bicester, drawing on Census 2011 journey to work data. The main movements are from the residential wards (South, West and North) to the wards containing most employment opportunities (East and Town).

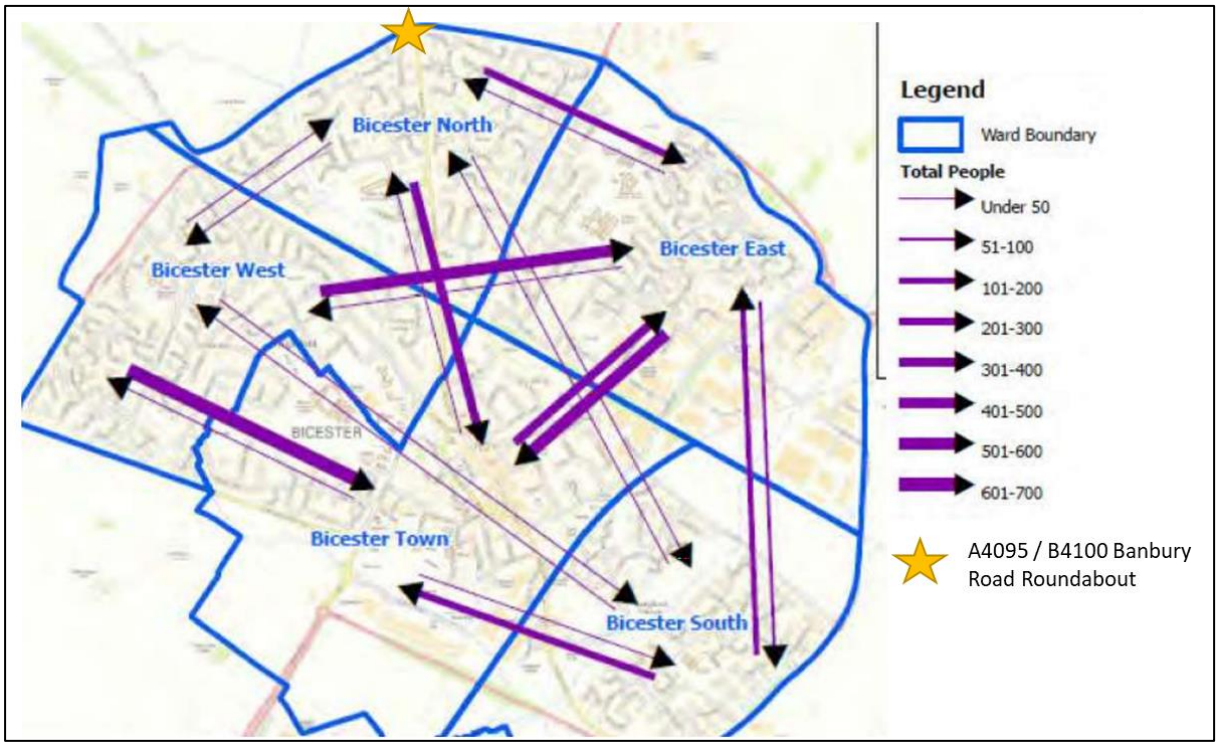

Figure 16. Internal Commuter Flows – Bicester Residents

Source: Census 2011; Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) (2020)

3.3.40 The 2011 travel survey data of Bicester residents provides information on journey purpose. Figure 17 shows the journey purpose of all internal trips by Bicester residents. Leisure, work and shopping trips make up the vast majority of trips (71%). Further information on the choice of mode depending on journey purpose is provided in Figure 18. Car use is the prioritised mode for work, business and personal trips, whereas active modes are especially favoured for education trips, and somewhat less so for shopping and leisure trips. This is to be expected, given that shopping and education trips tend to be more locally bound than work trips, which may require travelling out of Bicester to reach the workplace.

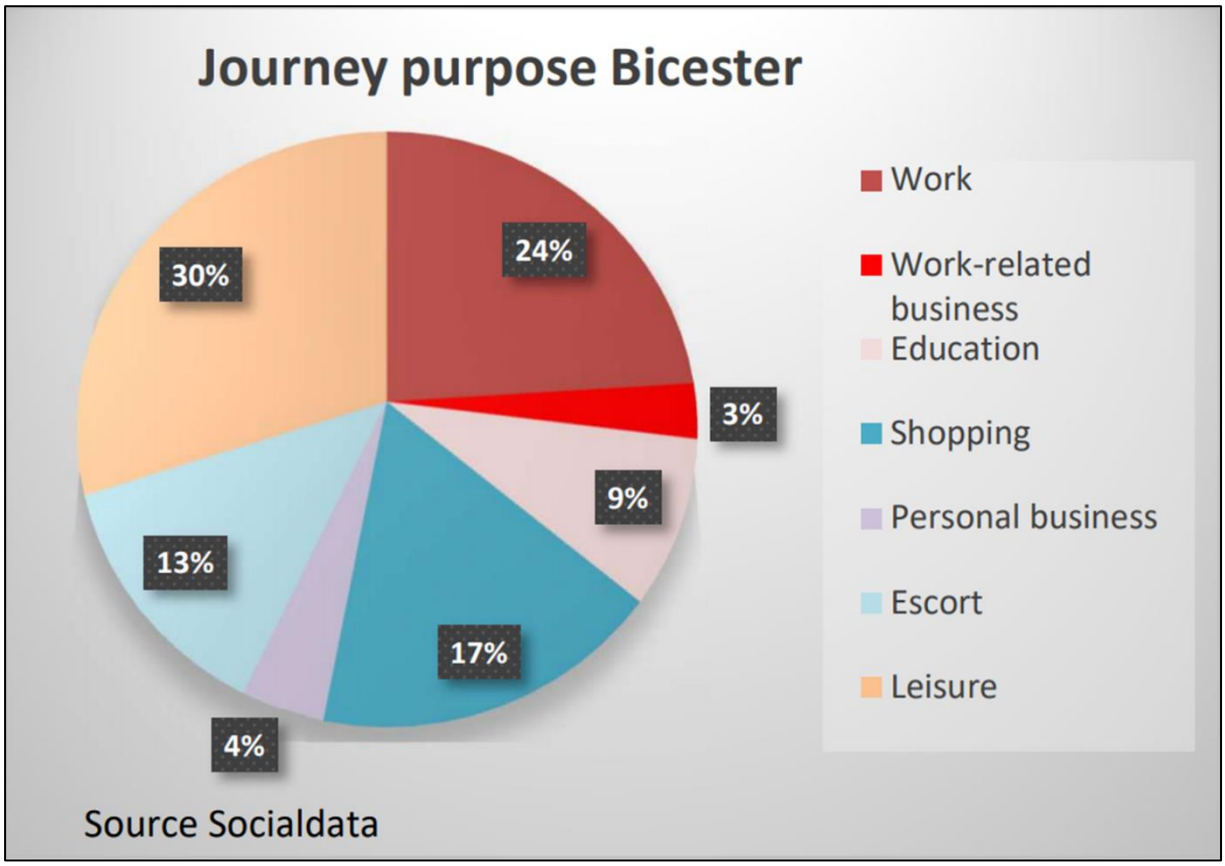

Figure 17. Internal Trips by Purpose (2011 Data)

Source: Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) (2020)

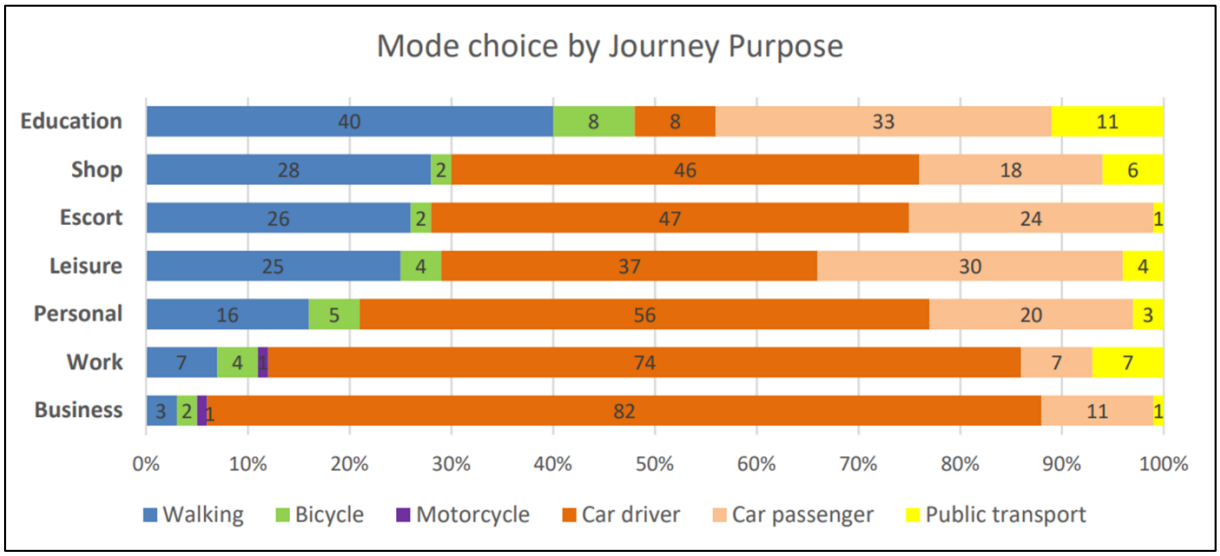

Figure 18. Modal Share by Journey Purpose (2011 Data)

Source: Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) (2020)

Journey Times, Traffic Flows and Congestion Issues

3.3.41 Traffic volumes at the A4095 / B4100 Banbury Road roundabout have been examined with key results shown in Table 6. This information has been derived from Manual Classified Turning Counts (MCTCs) collected in 2016.

3.3.42 Table 6 shows that around 1,000-1,100 vehicles use the A4095 eastern approach in the AM and PM peak periods. The level of traffic is somewhat lower on the A4095 western approach, ranging between 571 to 860 across the AM and PM peak periods.

Table 6. Traffic Flows – Manual Classified Turning Counts

Arm	AM (07:45-08:45)	PM (17:00-18:00)
A4095 western approach road – EB	571	787
A4095 western approach road – WB	860	779
A4095 eastern approach road – EB	944	1,123
A4095 eastern approach road – WB	1,040	1,104

Source: AECOM analysis based on 2016 Manual Classified Turning Counts

3.3.43 The 2016 MCTCs have been used to derive mode splits at the A4095 / B4100 Banbury Road roundabout. These are presented in Figure 19 and Figure 20 for the AM and PM peak periods, respectively.

3.3.44 Across all four approach arms at the roundabout, car use is the predominant mode, with around 83-93% of observed movements being undertaken by car. Around 10% of movements are by Light Good Vehicles (LGVs), whereas the highest proportions of Heavy Good Vehicles (HGVs) (around 5%) are observed along the B4100 northern approach and the A4095 eastern approach in the AM period. Close to 0% of the movements were undertaken by bike. Around 1% of movements were by bus along the Banbury Road southern approach.

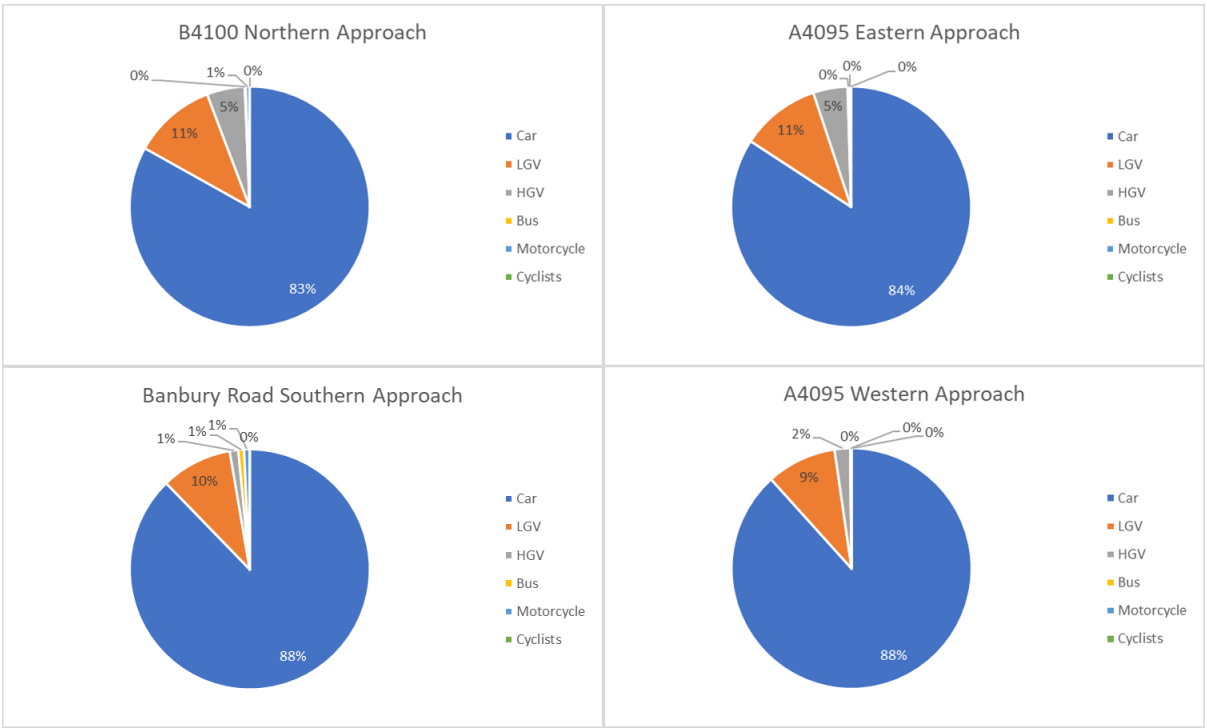

Figure 19. Mode Split – A4095 / B4100 Banbury Road Roundabout – AM

Source: AECOM analysis based on 2016 Manual Classified Turning Counts

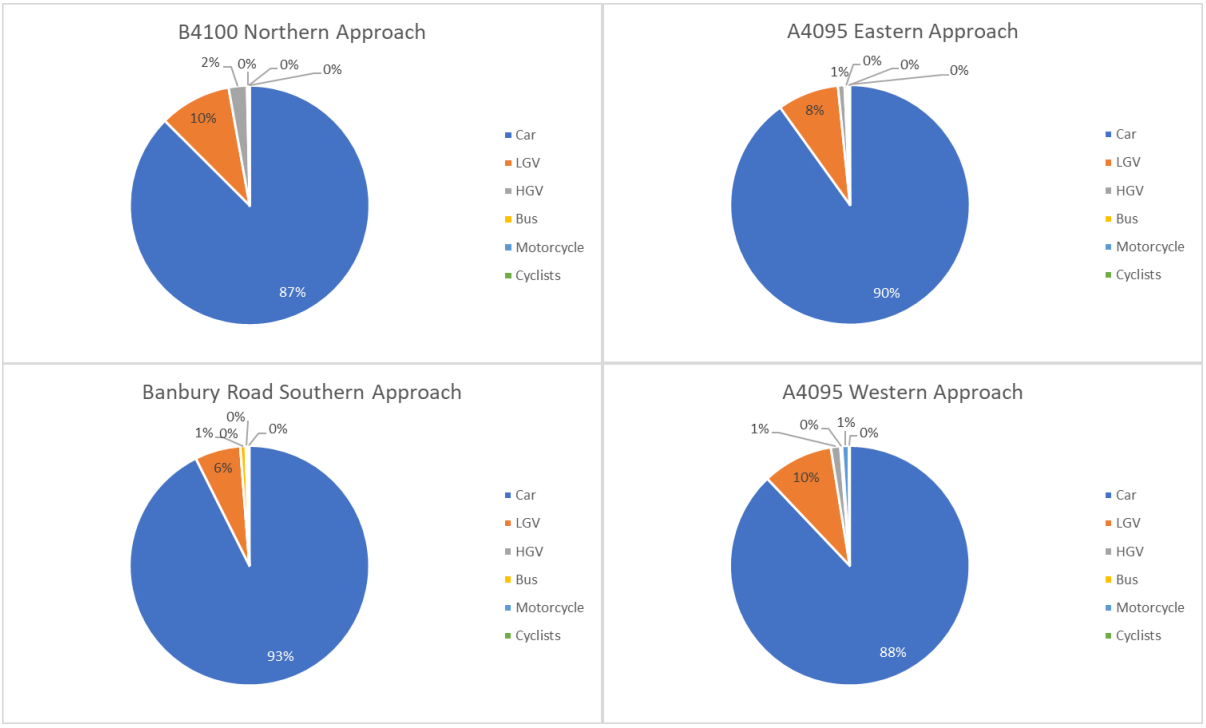

Figure 20. Mode Split – A4095 / B4100 Banbury Road Roundabout – PM

Source: AECOM analysis based on 2016 Manual Classified Turning Counts

3.3.45 Journey times through the A4095 / B4100 Banbury Road roundabout have been derived from 2019 Trafficmaster data. Figure 22 and Figure 23 show the journey time variability through the roundabout along the A4095 and the B4100, respectively (the journey time routes are shown in Figure 21).

3.3.46 Both figures clearly show that there is little journey time variability through the roundabout at present. It takes approximately 2 minutes to travel through the roundabout along the A4095 (Figure 22), with the greatest variability of around 9-14% observed in the eastbound direction in the PM peak period. This represents a variability of around 30 seconds. Conversely, it takes approximately 50 seconds to travel through the roundabout along the B4100 (Figure 23). Along this route, the greatest variability of around 8-21% is observed in the northbound direction in the AM period. This represents a variability of around 14 seconds.

3.3.47 Journey times along all routes through the roundabout have been derived and analysed. However, as the journey times are similar across all routes through the roundabout, with limited variability observed, only the two main routes are presented here.

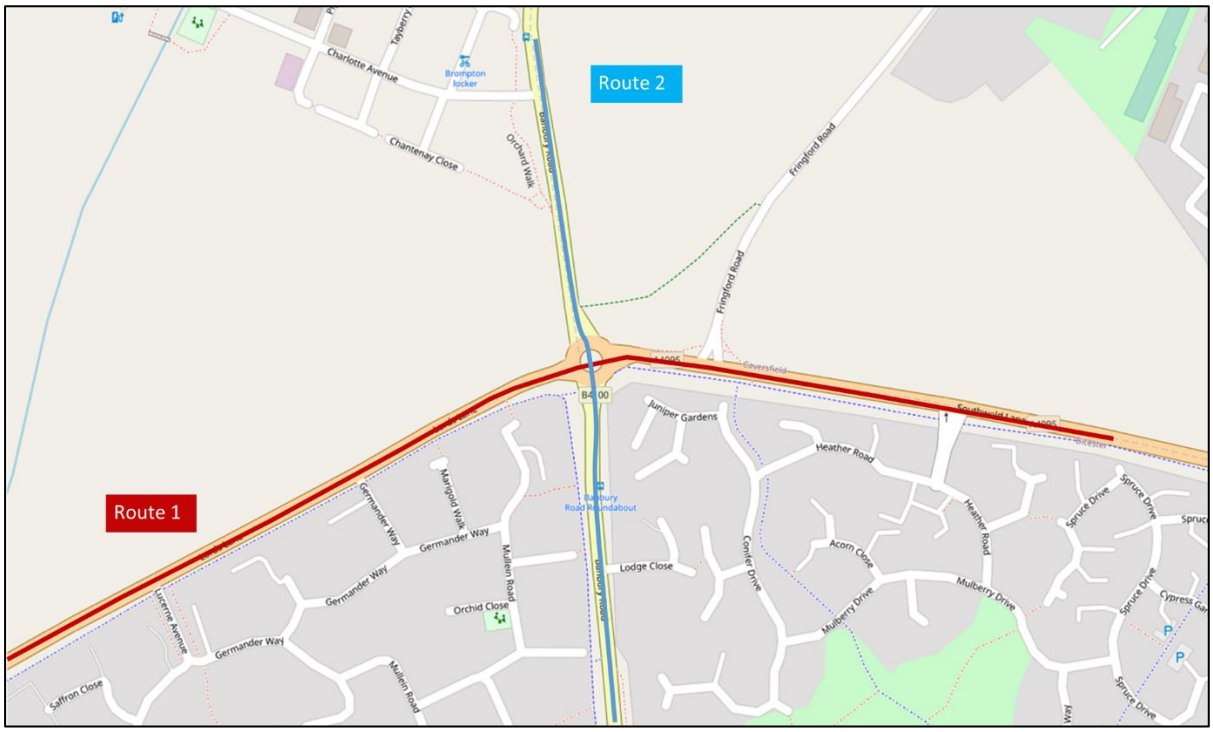

Figure 21. Journey Time Routes

Source: AECOM @ Crown Copyright and database right 2021

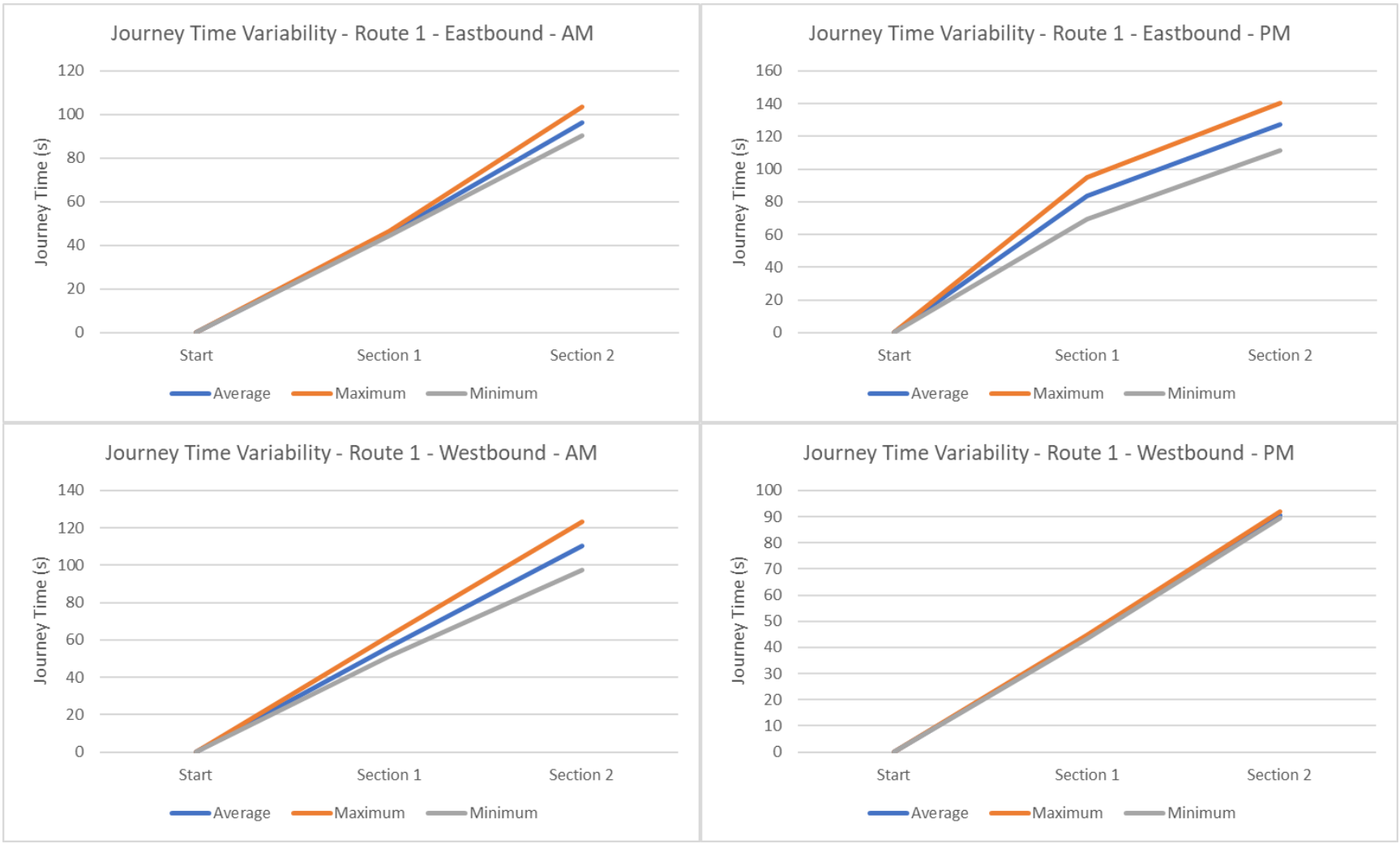

Figure 22. Journey Time Variability – Route 1

Source: AECOM analysis based on 2019 Trafficmaster data

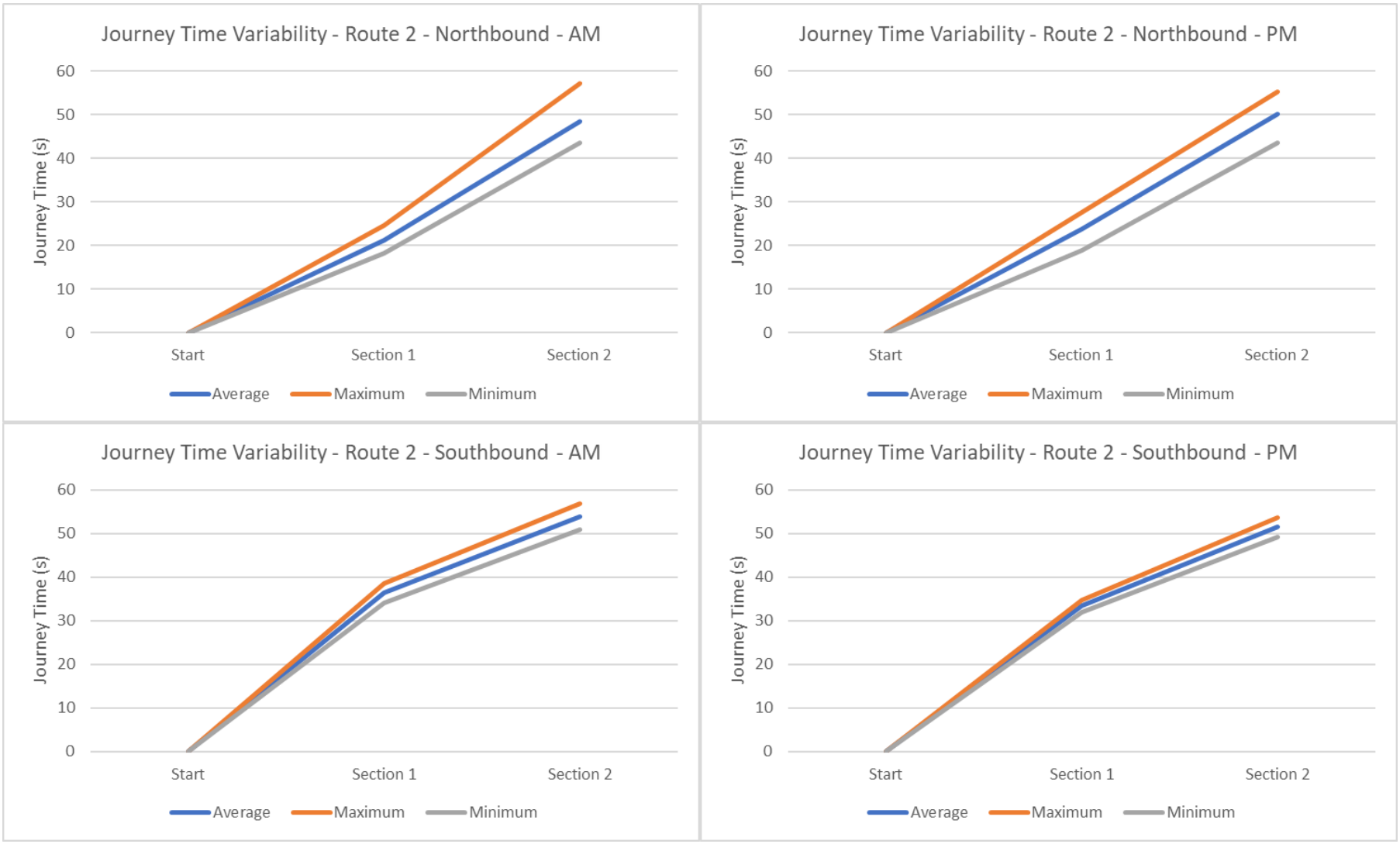

Figure 23. Journey Time Variability – Route 2

Source: AECOM analysis based on 2019 Trafficmaster data

3.3.48 The 2019 journey time information from the Trafficmaster data suggests that there is no significant congestion at the A4095 / B4100 Banbury Road roundabout at present.

3.3.49 However, significant capacity issues at the A4095 / B4100 Banbury Road roundabout are forecast given Local Plan growth and especially forecast trips generated by the North West Bicester development. ARCADY junction modelling[17] undertaken for the North West Bicester development forecasts capacity issues and significant queueing at the junction by 2031, as shown in Table 7.

3.3.50 Table 7 shows that the A4095 western approach and the Banbury Road southern approach are forecast to be over capacity in 2031. Queues of up to 57 vehicles are forecast on the A4095 western approach in the AM peak, whereas up to 229 vehicles are forecast on the Banbury Road southern approach in the PM peak. Such significant queues can be expected to block back to preceding junctions, such as the A4095 / Germander Way junction, creating capacity issues beyond the roundabout.

3.3.51 It should be noted that the ARCADY modelling incorporates the ambitious mode share targets at North West Bicester of at least 50% of trips generated by the development to be undertaken by sustainable modes. Therefore, the forecast capacity issues at the A4095 / B4100 Banbury Road roundabout represent the additional traffic generated above and beyond the ambitious vision for sustainable travel. The impact of North West Bicester on the highway network would be more significant if policy measures to support mode shift to other forms of travel were not in place.

3.3.52 Without intervention, there will be significant negative impacts on the highway network at and around the roundabout, which would have wider negative impacts, for example on journey times, emission levels and attractiveness for investment.

Table 7. Forecast Capacity – A4095 / B4100 Banbury Road Roundabout

	2012 Base				**2031 with Development**			
Arm	AM		PM		AM		PM	
	RFC*	Queue**	RFC	Queue	RFC	Queue	RFC	Queue
B4100 northern approach	0.478	0.9	0.402	0.7	0.709	2.4	0.654	1.9
A4095 eastern approach	0.441	0.8	0.555	1.2	0.634	1.7	0.897	8.1
Banbury Rd southern approach	0.365	0.6	0.351	0.5	0.602	1.5	1.543	229.0
A4095 western approach: Left turn	0.102	0.1	0.144	0.2	0.125	0.1	0.184	0.2
A4095 western approach: Ahead and Right turn	0.636	1.7	0.791	3.7	1.061	56.5	0.871	6.1

Source: NW Bicester Application 1: Land North of the Railway Line Transport Assessment (Hyder Consulting UK Limited-2212959)
** Ratio of Flow to Capacity (RFC)*
*** Queue measured in number of vehicles*

[17] NW Bicester Application 1: Land North of the Railway Line Transport Assessment (Hyder Consulting UK Limited-2212959)

Collisions

3.3.53 Figure 24 shows the location and severity of crashes (personal injury collisions) near the study area, based on STATS19 verified data between 2015-2019 in addition to provisional data from 2020.

3.3.54 A total of 18 collisions were recorded between the years of 2015-2020, out of which 15 were slight and 3 were severe. The majority of these collisions were due to behaviour factors and not road geometry factors. There is a cluster of accidents at the A4095 / B4100 roundabout which could be considered a hot spot. In total, 5 collisions were recorded at the roundabout, 2 of which involved cyclists. One of the collisions involving a cyclist occurred at the informal crossing just south of the roundabout on Banbury Road.

3.3.55 The Scheme will result in a new junction layout which will provide an opportunity to implement a safe design option to help reduce the number of collisions (such as by following design guidelines including Design manual for Roads and Bridges and DfT's Cycle Infrastructure Design: Local Transport Note 1/20).

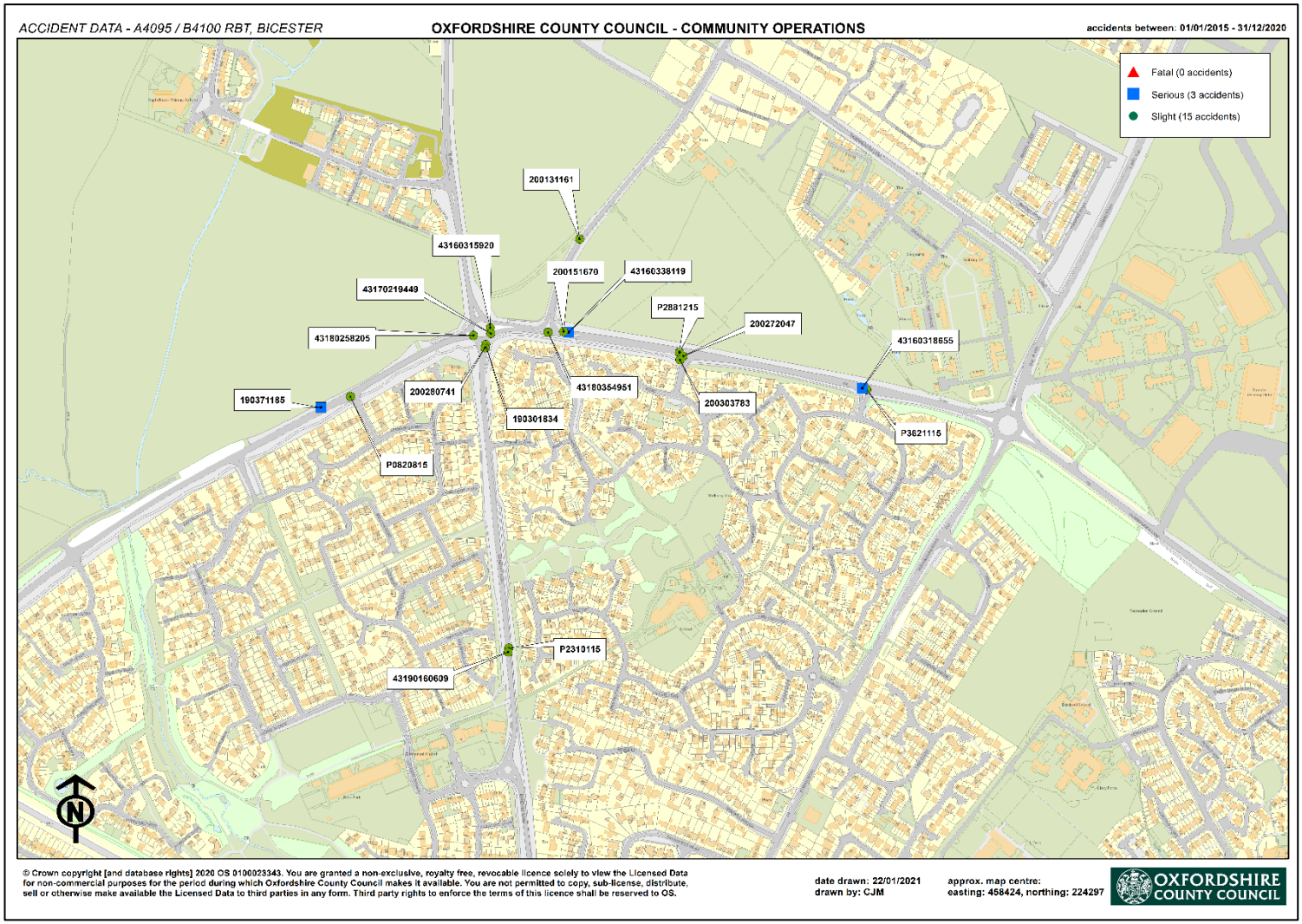

Figure 24. Location and Severity of Collisions (2015-2020)

Source: Oxfordshire County Council

Environmental Conditions

3.3.56 There are a number of environmental designations in Bicester, including an Air Quality Management Area (AQMA) incorporating sections of Kings End, Queens Avenue, Field Street, and St Johns Street in the town centre (Figure 25). An AQMA is an area where, based on review and assessment of air quality, the local authority has judged that it is unlikely to achieve the national air quality objectives. As a result of exceedances of the annual mean Limit Value for nitrogen dioxide (NO2), an AQMA was declared in Bicester in 2015.

3.3.57 Figure 25 shows other environmental designations across Bicester, such as the Local Nature Reserve in Bure Park and the Local Wildlife Site at Bicester Airfield to the northeast of Bicester. Bicester Airfield includes areas of species-rich grassland. However, as can be seen in Figure 25, neither of the environmental designations fall within the study area. In addition, there are no noise important areas in the study area, nor identified flood zones or scheduled monuments or listed buildings.

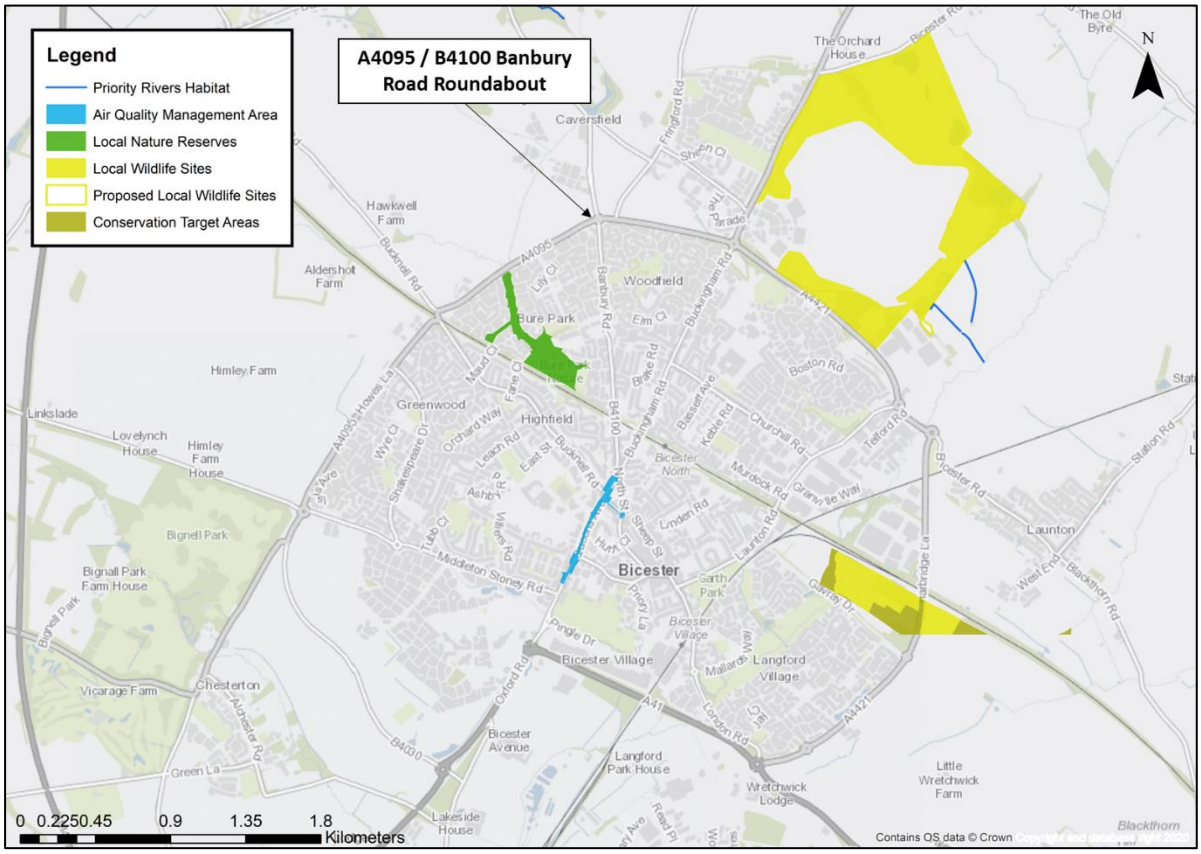

Figure 25. Environmental Designations

Source: Oxfordshire County Council; DEFRA; Natural England; AECOM @ Crown Copyright and database right 2021

3.3.58 There is a hedgerow at the northwest corner of the A4095 / B4100 Banbury Road roundabout (Figure 26). Any impacts on the hedgerow may need to be mitigated.

Figure 26. Environmental Constraint – Hedgerow

Source: Google Earth Pro™ imagery in the form of Google Map™ and Google Streetview™ have been used, unmodified, within this document. This imagery has been used within the extents of the AECOM license agreement with Google

3.4 Identifying the Need for Intervention

3.4.1 The analysis to date has demonstrated that there are significant forecast capacity challenges at the A4095 / B4100 Banbury Road roundabout. The ARCADY modelling forecasts queueing of up to 57 vehicles on the A4095 western approach in the AM peak, and 229 vehicles on the Banbury Road southern approach in the PM peak. Without intervention, there will be significant negative impacts on the highway network at and around the roundabout, which would have wider negative impacts, for example on journey times, emission levels and attractiveness for investment.

3.4.2 These challenges are situated in an area that is expected to change considerably in the next 10 to 20 years given the development coming forward at North West Bicester and the policy emphasis, at North West Bicester and across Bicester as a whole, on encouraging mode shift away from car use to more sustainable modes, particularly walking, cycling and bus use.

3.4.3 The A4095 / B4100 Banbury Road roundabout lies at the south-eastern corner of North West Bicester, a Strategic Development Site, and therefore has a strong geographical and functional relationship with the site. Its proximity also means that the nature of intervention to resolve the forecast capacity issues at the roundabout needs to take account of the transport policy targets at North West Bicester.

3.4.4 Thus, intervention is needed to:

- **Support the growth of homes and jobs, especially at North West Bicester**: North West Bicester is identified as a Strategic Development Site in Cherwell District Council's Local Plan, with 3,293 homes and 3,000 jobs expected to be delivered by 2031 (in total the site has capacity for 6,000 homes);
- **Address forecast capacity issues at the roundabout**: Significant capacity and congestion issues are forecast at the roundabout, which could hinder growth across Bicester and at North West Bicester especially;
- **Mitigate the impact of vehicular traffic issues on growth and the urban environment**: The forecast congestion issues are likely to worsen air quality and increase noise, with negative impacts on the urban environment and nearby communities;

- **Reduce carbon emissions from transport**: Motorised travel is associated with carbon emissions and other pollutants which exacerbates climate change and negatively impacts on people's health. National, regional and local policies emphasise the need to reduce carbon emissions from travel;
- **Encourage modal shift to sustainable travel**: There is a clear potential for more trips to be undertaken by sustainable modes, especially walking and cycling. Local policies emphasise the need to encourage a shift to sustainable travel; and
- **Reduce casualties and dangers associated with travel**.

3.4.5 As such, the analysis of challenges to date has demonstrated the need for interventions to address the issues and ensure the area has transport provisions suitable for the intended increase in housing and jobs at North West Bicester.

3.4.6 The next chapter sets out the project objectives that have been developed on the basis of the identified challenges and existing policies, both local and national.

4 Development of Project Objectives

4.1 Project Objectives

4.1.1 Following the review of the challenges and need for intervention to address these for Bicester and the planned developments, and the review of the goals and objectives set out in LTP4 and local plans, a set of localised objectives specific to the study were created. They were developed to address the specific problems identified in existing work and also to take into account the relevant County and District goals and objectives.

4.1.2 Whilst all these plans include proposed interventions and potential options, these were not taken into account in formulating the Scheme's objectives. Instead, the key challenge and priorities were distilled, and objectives created accordingly.

4.1.3 The objectives were agreed in consultation with Oxfordshire County Council.

4.1.4 The objectives are shown in Table 8, where they are mapped against the relevant national, regional and local policies, thereby demonstrating close alignment with policy.

Table 8. Alignment between Project Objectives and Key Policy Documents

Number	Objective	Challenge Summary	Measure of Success	Mapping to Key Policy Objectives		
				National Policy	Regional Policy	Local Policy
1	Support the growth of new homes and jobs, and increase economic vitality	Cherwell will deliver an increase of 22,840 homes by 2031, a significant proportion of which will be centred in Bicester and especially at North West Bicester, a Strategic Development Site connected to the study area. Up to 6,000 homes and 3,000 jobs are committed at the site.	Delivery of homes and jobs	National Infrastructure Strategy; Transport Investment Strategy	Strategic Economic Plan; Oxfordshire Local Industrial Strategy; Oxfordshire's Housing and Growth Deal; Connecting Oxfordshire Local Transport Plan 4	Active and Healthy Travel Strategy; Cherwell District Council's Local Plan
2	Provide a resilient solution which addresses the forecast levels of congestion at the A4095 / B4100 Banbury Road roundabout	Significant capacity issues are forecast at the A4095 / B4100 Banbury Road roundabout. Modelling predicts queues of up to 57 vehicles on the A4095 western approach in the AM peak, and 229 vehicles on the Banbury Road southern approach in the PM peak. This is expected to have wider negative impacts, for example on journey times, emission levels and attractiveness for investment.	No increase in queueing along the approaches to the A4095 / B4100 Banbury Road	Transport Investment Strategy	-	Bicester Area Transport Strategy; Active and Healthy Travel Strategy
3	Mitigate the impact of vehicular traffic issues at the A4095 / B4100 Banbury Road roundabout on communities and the urban environment	The forecast congestion and queueing are expected to have adverse effects on nearby communities and the urban environment, especially in terms of air quality, noise, health and visual impacts.	No adverse environmental impacts	National Planning Policy Framework	Strategic Economic Plan; Connecting Oxfordshire Local Transport Plan 4	Active and Healthy Travel Strategy; Cherwell District Council's Local Plan
4	Reduce carbon emissions from transport in the town	Motorised travel is associated with carbon emissions and other pollutants which exacerbates climate change and negatively impacts on people's health. National, regional and local policies	Reduced carbon emissions	Gear Change	Connecting Oxfordshire Local Transport Plan 4	Active and Healthy Travel Strategy

Number	Objective	Challenge Summary	Measure of Success	Mapping to Key Policy Objectives		
				National Policy	Regional Policy	Local Policy
		emphasise the need to reduce carbon emissions from travel.				
5	Encourage alternative forms to car use where suitable including public transport, active travel and smarter choices	Given the contained nature of Bicester and the high proportion of internal trips, there is a clear potential for a larger proportion of trips to be made by sustainable modes. Local policies, both across Bicester and at North West Bicester, require enhancement and encouragement of sustainable travel choices, in particular active travel.	Mode shift to walking, cycling and bus use	Transport Investment Strategy; Gear Change	-	Bicester Area Transport Strategy; Active and Healthy Travel Strategy; Cherwell District Council's Local Plan; Bicester Sustainable Transport Strategy; Bicester Local Cycling and Walking Infrastructure Plan
6	Reduce casualties and dangers associated with travel	While relatively few accidents have occurred in the study area in recent years, road safety is expected to decrease given the forecast capacity issues at the roundabout. Road safety is a key concern in the Connecting Oxfordshire Local Transport Plan 4.	Reduced number of accidents	The Road Safety Statement 2019: A Lifetime of Road Safety	Connecting Oxfordshire Local Transport Plan 4	-

5 Option Development and Sifting

5.1 Introduction

5.1.1 This chapter discusses the option development method and assessment framework developed to sift the options, including the results of each sifting step. The assessment framework has been developed in accordance with the Department for Transport's Transport Appraisal Process (2018) and the Early Assessment Sifting Tool (EAST) Guidance (2017).

5.1.2 The options have been derived based on:

- Assessment of current and forecast travel patterns, development and growth, and identified challenges, especially the forecast capacity issues at the A4095 / B4100 Banbury Road roundabout and the Eco-town mode shift aspirations at the North West Bicester development site (summarised in Section 3 of this report);
- Review of previous and current proposals from the relevant local authorities and stakeholders;
- Consultation with Oxfordshire County Council officers and stakeholders; and
- Professional judgement based on experiences elsewhere and within Oxfordshire.

5.1.3 It is recognised that options could be packaged in order to provide an optimum solution to the identified problems and achieve the scheme objectives. However, funding, financing and affordability as well as deliverability will need to be taken into account for not just single options but also potential packages. Delivery may be dependent on different agencies, developers and funding sources, and completion and sign-off of other emerging strategies.

5.1.4 Options that are sifted out may still perform well either as part of an overall package; to address other specific issues such as new developments; or following implementation of other options.

5.2 Methodology

5.2.1 To ensure that a robust option generation and appraisal process was undertaken, one which considered a wide range of options and was not biased towards a pre-determined option type, a three-step option generation and four-step sifting process was adopted. The option generation and appraisal process is outlined in Figure 27 and discussed in more detailed throughout this section.

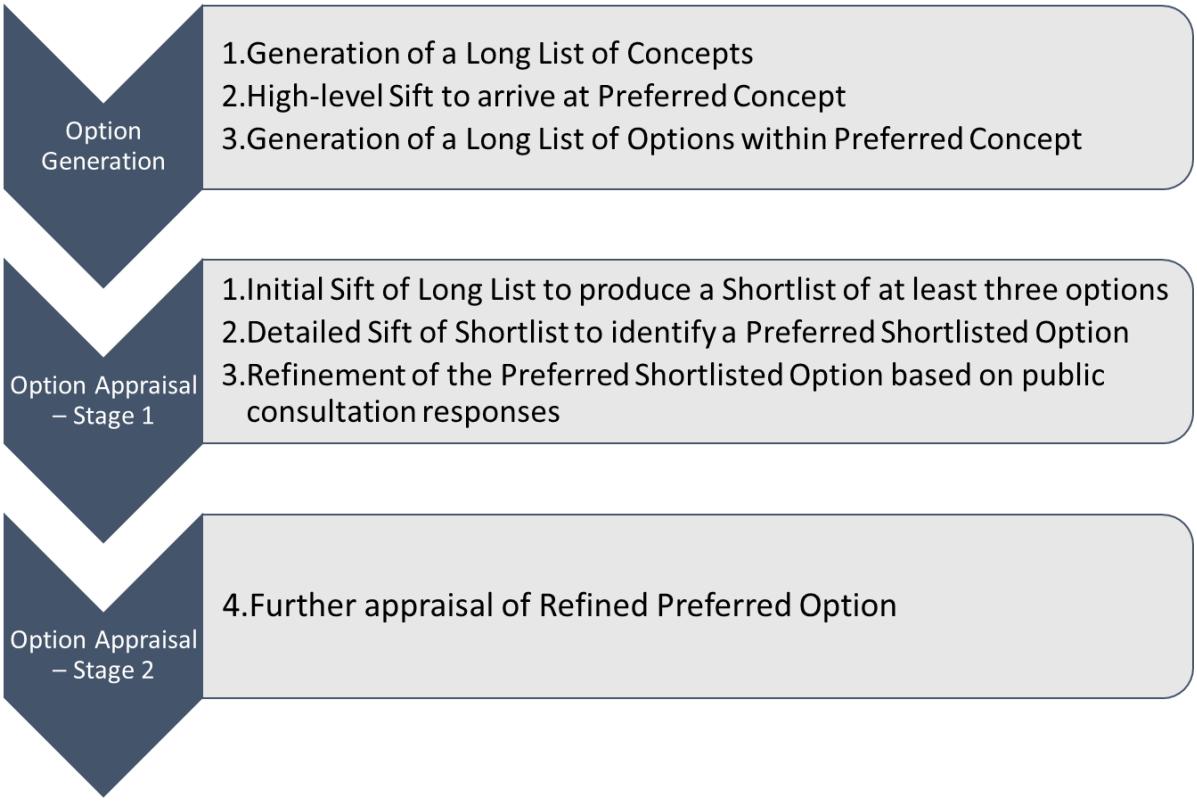

Figure 27. Option Generation and Appraisal Process

Option Generation

5.2.2 A three-step option generation process based on concepts was adopted. A concept is a broad category of intervention types, such as highways improvement, active travel provision, and demand management initiatives. The generation of a list of concepts allowed for the identification of a range of intervention types that could address the project objectives. This process was informed by the current and future context analysis, policy review, and project objectives, thereby generating broad concepts that could address the identified challenges and policy priorities.

5.2.3 The option generation process is set out in Table 9.

Table 9. Option Generation Process

Step	Purpose	Description
1	Generation of a Long List of Concepts	Generation of a Long List of concepts that are likely to achieve the project objectives and address identified challenges.
2	High-level Sift to determine which Concept is suitable	High-level sift against project objectives in addition to affordability, technical complexity, and acceptability criteria.
3	Generation of a Long List of options within the Preferred Concept	Based on the Preferred Concept, generation of a Long List of options.

5.2.4 The high-level sift of concepts consisted of scoring against project objectives as well as an assessment against affordability, technical complexity, and acceptability criteria. The intention was to sift down to a Preferred Concept, based on which a Long List of options could be generated.

5.2.5 The criteria and scoring for the high-level sift are set out in Table 10.

Table 10. High-level Concept Sift

Criteria	Description	Scoring
Project objectives	Agreed project objectives – each of the six objectives will be scored separately	Scores between 2 and -2: **Very good fit (2)/ Good fit (1)/ Neutral or negligible impact (0)/ Poor fit (-1)/ Very poor fit (-2)**
Affordability	Considers cost of implementation and operation and whether these are affordable through current funding arrangements	Scores between 2 and -2: **No risk of exceeding budget (2)** to **Significantly over budget (-2)**
Technical complexity	Considers practical feasibility of an option in terms of engineering and complexity	Scores between 2 and -2: **Straightforward to build and/or maintain (2)** to **Very complex to build and/or maintain (-2)**
Acceptability	Considers the challenges around gaining consent for the project, stakeholder and public support	Scores between 2 and -2: **Very likely to be acceptable by public or stakeholders (2)/ Likely to be acceptable by public or stakeholders (1)/ Neutral/ Unknown (0)/ Unlikely to be acceptable by public and stakeholders (-1)/ Open to challenge (-2)**

5.2.6 Professional judgement was used to inform the assessment of concepts against the identified criteria and to generate a Long List of options, within the Preferred Concept, that could address the identified challenges and project objectives.

Option Appraisal

5.2.7 Once a Long List of options was generated, a four-step sifting process was undertaken, as set out in Table 11.

Table 11. Sifting Process

Sifting Step	Sift Purpose	Sift Method
Sift 1 – Initial Sift	Initial Sift of Long List of options to get to a Shortlist of at least three options	Strategic Sift against project objectives and against affordability, deliverability, acceptability, and technical complexity criteria
Sift 2 – Detailed Sift	Detailed Sift of the Shortlisted options to arrive at a Preferred Shortlisted Option	More detailed analysis and sift against strategic, economic, financial, management and commercial cases to create a Preferred Shortlisted Option, using traffic modelling results where possible
Refinement	Refinement of the Preferred Shortlisted Option based on public consultation responses	Analysis of the public and stakeholder consultation responses and subsequent revision of the Preferred Shortlisted Option design to address the key consultation themes
Sift 3 – Further Appraisal	Further appraisal of the Refined Preferred Option	Assessment of the Refined Preferred Option in line with the methodology set out in the Appraisal Specification Report (ASR)

5.2.8 Sift 1 consisted of a Strategic Sift against project objectives as well as an assessment against affordability, deliverability, acceptability and technical complexity criteria. The

criteria and scoring are set out in Table 12. The intention was to sift down to about three options that could then be taken forward to public consultation.

Table 12. Sift 1 Criteria

Criteria	Sub-criteria	Description	Scoring
Project objectives	Project objectives	Agreed project objectives – each of the six objectives were scored separately	Scores between 2 and -2: **Very good fit (2)/ Good fit (1)/ Neutral or negligible impact (0)/ Poor fit (-1)/ Very poor fit (-2)**
Perceived Feasibility	Affordability	Considers cost of implementation and operation and whether these are affordable through current funding arrangements	Scores between 2 and -2: **No risk of exceeding budget (2)** to **Significantly over budget (-2)**
	Deliverability	Concentrates on the dependency of the option and interface risk in relation to other projects, network disruption during construction, timescale of delivery during design phase, contractual complexity, land requirements and risks	Scores between 2 and -2: **Significant deliverability (2)/ Reasonable deliverability (1)/ Neutral (0)/ Some risks related to deliverability (-1)/ Considerable risks related to deliverability (-2)**
	Acceptability	Considers the challenges around gaining consent for the project, stakeholder and public support	Scores between 2 and -2: **Very likely to be acceptable by public or stakeholders (2)/ Likely to be acceptable by public or stakeholders (1)/ Neutral/ Unknown (0)/ Unlikely to be acceptable by public and stakeholders (-1)/ Open to challenge (-2)**
	Technical complexity	Considers practical feasibility of an option in terms of engineering and complexity	Scores between 2 and -2: **Straightforward to build and/or maintain (2)** to **Very complex to build and/or maintain (-2)**

5.2.9 The lowest scoring options were ruled out after Sift 1, based on discussion between the wider project team and Oxfordshire County Council, forming a Shortlist of three options.

5.2.10 The Shortlisted options were taken forward to public consultation. As a result of the Covid-19 pandemic, the consultation took place digitally via Oxfordshire County Council's Consultations Home webpage between 19th March and 9th April 2021.

5.2.11 Sift 2 involved an assessment against strategic, economic, financial, management and commercial criteria (Table 13). The Early Assessment Sifting Tool (EAST) provided the framework for this process and high-level criteria aligned with DfT's Option Assessment Framework were identified. The more detailed criteria for each case are

listed in Appendix A. The intention was to sift down to one Preferred Shortlisted Option that could be refined further based on the public consultation responses.

Table 13. Sift 2 Criteria

Criteria	Description	Scoring
Strategic Case	Fit with project objectives and wider transport and government objectives	Scores between 2 and -2: **Very good fit (2)/ Good fit (1)/ Neutral or negligible impact (0)/ Poor fit (-1)/ Very poor fit (-2)**
Economic Case	The scale of benefits arising from the improved transport network in terms of connectivity, reliability, resilience, housing, economic impacts, environmental and social impacts	
Financial Case	Assessment of infrastructure capital costs, operating and maintenance costs	
Management Case	Assessment of option feasibility and stakeholder and public accessibility	
Commercial Case	Flexibility of an option, funding and income potential	

5.2.12 Each case had a number of sub-criteria, with the intention that these would be more fully developed using available data and modelling as the project progressed.

5.2.13 To inform the assessment, detailed drawings were produced for each of the options scored against the Sift 2 criteria.

5.2.14 The third step of the sifting process involves further appraisal of the Refined Preferred Option in line with the methodology set out in the Appraisal Specification Report (ASR), including more detailed modelling.

5.3 Option Generation

5.3.1 This section presents the results from the option generation process, in which a Long List of concepts was generated, which was then sifted down to identify a Preferred Concept that formed the basis for the generation of a Long List of options.

5.3.2 The Long List of concepts was initially developed by the project team and discussed with OCC for their feedback. Table 14 provides the list of concepts generated.

5.3.3 In generating the concepts, different forms of interventions were broadly categorised into concepts, considering:

- Infrastructure based interventions;
- Operational and service based interventions;
- Mode specific interventions;
- Demand based interventions; and
- Location specific interventions.

Table 14. Long List of Concepts

Number	Concept	Description
1	Pedestrian and cycle network	Infrastructure based interventions to enhance and/or provide new pedestrian and cycle network. E.g. shared use paths, crossings, which may or may not be segregated.
2	Bus service improvements	Service based interventions to improve the bus service provision. E.g. changes to service network, greater service frequency (on new and/or existing routes).
3	Bus priority network	Infrastructure based interventions to provide bus priority. E.g. Bus Rapid Transit system, dedicated bus lane(s), Park & Ride, public transport network of autonomous vehicles.
4	New rail station	Infrastructure based intervention providing a new station to improve access to railway network.
5	New highway	Infrastructure based interventions to increase highway capacity through provision of a new road. E.g. introduction of a link road or bypass.
6	Capacity improvements on existing highway	Infrastructure based interventions to provide additional highway capacity. E.g. additional lane(s).
7	Junction capacity improvement	Infrastructure based interventions to improve junction capacity for all road users. E.g. increased capacity of roundabout, signalised junction.
8	Travel planning	Demand based interventions to encourage people to travel less and/or more sustainably. E.g. bike training scheme, sustainable travel vouchers. This also includes interventions to encourage businesses and their staff to travel more sustainably to work. E.g. workplace parking levy, cycle to work scheme, electric vehicle charging points.
9	On-demand sharing scheme	Demand based interventions to encourage people to travel smarter using on-demand sharing schemes. E.g. sharing schemes for use of cars (including electric vehicles) and cycles.
10	Demand management through pricing/charging	Pricing/charging based interventions to encourage people to travel less and/or more sustainably. E.g. workplace parking levy, congestion charging.

5.3.4 Each of the longlisted concepts were assessed against the criteria outlined in Table 10, with their sifting scores calculated and thereafter ranked. The total ranking score was derived by providing equal weight to the individual criteria. In Table 15, the high-level sift score ranking is presented for all the concepts. If concepts scored the same, they share the same ranking position. Detailed scoring for each concept is provided in Appendix B. The best ranking concepts were ‘Pedestrian and cycle network’ (concept #1) and ‘Junction capacity improvement’ (concept #7).

Table 15. High-level Sift Score Ranking

Number	Concept	Total Rank
1	Pedestrian and cycle network	1
2	Bus service improvements	3
3	Bus priority network	6
4	New rail station	8
5	New highway	10
6	Capacity improvements on existing highway	9
7	Junction capacity improvement	1
8	Travel planning	4
9	On-demand sharing scheme	4
10	Demand management through pricing/charging	7

5.3.5 In assessing the Long List of concepts, consideration was also given to other interventions, plans and programmes coming forward in Bicester. As discussed in Section 2.3.1, the wider transport strategy in Bicester focuses on encouraging sustainable travel, as set out in the Bicester Area Transport Strategy (2016), the Infrastructure Delivery Plan to Cherwell District Council's Local Plan 2011-2031 (2015), Bicester Local Cycling and Walking Infrastructure Plan (2020), Eco Bicester One Shared Vision (2010), and the North West Bicester Supplementary Planning Document (2016). Key transport measures promoted across these policy documents include:

- Highway capacity improvements to peripheral routes;
- A4095 rail bridges – providing two underpasses, one for motorised traffic and one for pedestrians and cyclists, to the railway line near the Howes Lane / Bucknell Road junction;
- A4095 realignment – realignment of Howes Lane between Middleton Stoney Road roundabout to approximately 500 metres from the A4095 / B4100 Banbury Road roundabout, including provision for pedestrians and cyclists;
- Bus only link west of Howes Lane as part of the A4095 realignment scheme;
- East-West Rail Phase 2 (Phase 1 having been completed in 2016) – Oxford to Milton Keynes, Bletchley to Bedford;
- Electric vehicle initiatives;
- Car club;
- Footpaths and cycle paths through the North West Bicester development site and connecting to the A4095 and B4100;
- Pedestrian and cycle provision across Bicester; and
- Public realm improvements in the town centre.

5.3.6 Existing transport proposals fall within the broader concept categories of highway capacity improvements, bus priority network, pedestrian and cycle network, and wider demand-based interventions, such as the car club and electric vehicle initiatives. As such, it is clear that these concepts have been considered in previous work to date and the relative benefit of taking forward additional interventions within these concepts was questioned.

5.3.7 Given the outcome of the high-level sift and consideration of forthcoming measures, a junction capacity improvement (concept #7) with infrastructure to support / enhance pedestrian and cyclist movements was taken forward as the Preferred Concept. The

Preferred Concept formed the base upon which an additional option generation exercise was undertaken to generate a Long List of options.

5.3.8 The Long List of options was initially developed in a workshop with the technical disciplines of the project team and thereafter discussed with OCC for their feedback. Table 16 provides the list of options generated. A total of 13 options were developed.

Table 16. Long List of Options

Number	Option	Description
1	Retrofit of existing roundabout	Retain existing roundabout geometry and provide pedestrian and cyclist crossing facilities close to the roundabout.
2	Dutch style roundabout with pedestrian and cyclist crossings close to the roundabout	The Dutch style roundabout has large zebra crossings at the entries and exits. Cyclists are given a dedicated lane through the roundabout and have right of way. To promote lower speeds, the entries and exits for motorised traffic are narrower than in a standard roundabout.
3	Higher capacity roundabout with pedestrian and cyclist crossings away from the roundabout	The roundabout would be increased in size to provide more road capacity. The shared use path on the north side of A4095 western approach road is provided within the North West Bicester development site to minimise impact on the existing hedgerow around the roundabout. Pedestrian and cyclist crossings are provided away from the roundabout, in a similar position to existing crossing facilities and will be improved where possible.
4	Higher capacity roundabout with pedestrian and cyclist crossing facilities close to the roundabout	The roundabout would be increased in size to provide more road capacity, similar to Option 3, but with crossing facilities for pedestrians and cyclists provided closer to the junction, compared to the existing provision. Crossings unlikely to be single stage due to size of roundabout to provide for capacity improvements.
5	Higher capacity roundabout with A4095 underpasses for pedestrians and cyclists	The roundabout would be increased in size to provide more road capacity, similar to Option 3, with pedestrian and cyclist crossing facilities provided via underpasses of the A4095 near the A4095 / B4100 junction.
6	Higher capacity roundabout with pedestrian and cyclist bridge crossings of A4095	The roundabout would be increased in size to provide more road capacity, similar to Option 3, with pedestrian and cyclist crossing facilities provided via foot/cycle bridges of the A4095 near the A4095 / B4100 junction.
7	Shared space roundabout	The shared space roundabout involves less formal integration between modes through the removal or reduction of priority and physical divides between users. Provision for cyclists is generally not segregated from motorised traffic or pedestrians, allowing different road users to mix. Formal crossing facilities for pedestrians and cyclists are generally not provided.
8	Turbo roundabout with crossing facilities away from the junction	Design enables separation between the circulatory lanes, providing a spiralling flow of traffic which requires drivers to choose their direction before entering the roundabout. Crossing facilities provided away from the junction, in a similar position to existing crossing facilities.
9	Signalised roundabout with crossing facilities close to the roundabout	Standard signalised roundabout with pedestrian and cyclist crossing facilities provided close to the roundabout. Crossings unlikely to be single stage due to size of roundabout to provide for capacity improvements.
10	CYCLOPS junction with pedestrian and cyclist crossings close to the junction	The CYCLOPS (Cycle Optimised Protected Signals) junction is a type of signalised junction which includes a radial segregated cycle track that encircles the junction. Cyclists can turn right while being protected from traffic, and can make this manoeuvre in one movement (subject to signal timings). Pedestrians cross

Number	Option	Description
		the cycle track to refuges where they can access direct crossings over each arm of the junction. The pedestrian and cyclist crossings are provided close to the junction
11	Signalised junction with bus priority and pedestrian and cyclist crossings close to the junction	The signalised option is a standard signalised crossroads junction, with two lane entries at a minimum. Signalisation allows for signal priority for buses approaching the junction, minimising delay for future bus services. Pedestrian and cyclist crossings can be provided close to the junction.
12	Signalised junction with dedicated bus lane and crossing facilities close to the junction	Signalised crossroads junction with dedicated bus lane and signal priority for buses. Pedestrian and cyclist crossings can be provided close to the junction.
13	At grade Hamburger junction with pedestrian and cyclist crossings close to the junction	A type of signalised roundabout in which the main road passes through the centre of the roundabout, with crossing facilities close to the junction. Crossings unlikely to be single stage due to size of roundabout to provide for capacity improvements.

5.4 Sift 1 – Initial Sift

5.4.1 This section presents the results from sift 1, the initial sift, in which the Long List of options was assessed to identify a Shortlist of three options.

5.4.2 Each of the Longlisted options identified in Table 16 were assessed against the criteria outlined in Table 12, with their sifting scores calculated and combined to overall totals for the project objectives and perceived feasibility sift. In Table 17, the sift 1 scores are presented for all the longlisted options (with the three shortlisted options highlighted in grey). Detailed scoring for each option is provided in Appendix C.

5.4.3 The Longlisted options were initially scored by the project team and thereafter discussed with OCC for their feedback.

5.4.4 It should be noted that as the Longlisted options are more detailed than the concepts assessed in the High-level Sift, the scores against project objectives and the perceived feasibility criteria for the Longlisted options will differ from the scores assigned to the ‘junction capacity improvement’ and concept in the High-level Sift.

Table 17. Sift 1 Score Results

Number	Option	Score for Objectives	Score for Perceived Feasibility
1	Retrofit of existing roundabout	-3	1
2	Dutch style roundabout with pedestrian and cyclist crossings close to the roundabout	-1	2
3	Higher capacity roundabout with pedestrian and cyclist crossings away from the roundabout	2	2
4	Higher capacity roundabout with pedestrian and cyclist crossing facilities close to the roundabout	1	-1
5	Higher capacity roundabout with A4095 underpasses for pedestrians and cyclists	2	-3
6	Higher capacity roundabout with pedestrian and cyclist bridge crossings of A4095	3	-3
7	Shared space roundabout	-2	-2
8	Turbo roundabout with crossing facilities away from the junction	3	-1
9	Signalised roundabout with crossing facilities close to the roundabout	6	-5
10	CYCLOPS junction with pedestrian and cyclist crossings close to the junction	7	1
11	Signalised junction with bus priority and pedestrian and cyclist crossings close to the junction	7	3
12	Signalised junction with dedicated bus lane and crossing facilities close to the junction	4	-3
13	At grade Hamburger junction with pedestrian and cyclist crossings close to the junction	6	-5

5.4.5 To identify the options to take forward in the Shortlist, a qualitative assessment of the Sift 1 results was undertaken by the project team and in consultation with OCC, specifically assessing which options would be feasible to deliver, be affordable and likely to meet the project objectives. This exercise involved consideration against all project objectives (including both capacity and growth related objectives, and those more focussed on sustainable travel and carbon emissions) and all four criteria in the perceived feasibility sift. Three Longlisted options produced an overall positive score for both project objectives and perceived feasibility. They were options #3, #10 and #11, as identified in Table 17. These three Longlisted options formed the Shortlisted options. These options and the justification for why they were taken forward is presented in Table 18. All three options are considered to be feasible to deliver and affordable.

Table 18. Shortlisted Options

Number	Option	Long List #	Justification for Selection
1	Higher capacity roundabout with pedestrian and cyclist crossings away from the roundabout	3	This option is likely to increase road capacity for motorised vehicles which will improve the flow of traffic, and therefore helps to mitigate the impact of growth. While crossing facilities for pedestrians and cyclists will be enhanced where possible, the crossing locations are not close to some of the desire lines.
2	Signalised junction with bus priority and pedestrian and cyclist crossings close to the junction	11	This option is likely to increase road capacity for motorised vehicles and therefore helps to mitigate the impact of growth. It promotes sustainable travel through safe and convenient crossings for pedestrians and cyclists. Signalisation allows for signal priority to buses approaching the junction, minimising delay for future bus services. As this option provides crossings that tie in with the surrounding off-road cycle network, there is less provision for cyclists approaching the junction on the carriageway, compared to the CYCLOPS option (option #3). Cycle movements crossing the road may take longer in some instances, as it will take two stages to cross two arms of the junction.
3	CYCLOPS junction with pedestrian and cyclist crossings close to the junction	10	By minimising delay for pedestrians and cyclists, this option promotes travel by walking and cycling and therefore encourages sustainable travel. It improves protection for pedestrians and cyclists from motorised traffic. While enhancing pedestrian and cyclist crossings, the option preserves the capacity for motorised vehicles at the junction as much as possible. Signalisation allows for signal priority to buses approaching the junction, minimising delay for future bus services. This option is not likely to increase capacity for motorised vehicles to the same extent as the other two options.

5.5 Sift 2 – Detailed Sift

Introduction

5.5.1 This section presents the results from Sift 2, the detailed sift, in which the Shortlisted options were assessed to identify a Preferred Shortlisted Option.

5.5.2 Detailed drawings were developed for each of the Shortlisted options identified in Table 18 and they were assessed against the criteria outlined in Table 13 (the more detailed criteria are provided in Appendix A). The drawings are provided in Figure 28, Figure 29 and Figure 30.

5.5.3 Initially, the wider project team, including all the technical disciplines, discussed the Shortlisted options and identified the sifting scores based on assessment undertaken by the technical disciplines. These scores were then modified in consultation with OCC and during a workshop with OCC on 13th April 2021.

5.5.4 It should be noted that scoring of the options was based on pre-mitigation conditions, i.e. not considering the extent to which negative impacts could be mitigated or how the options may score following mitigation. This was done as incorporating mitigation would have required further technical consideration and the implementation may have had other secondary effects, such as impact on costs and technical deliverability.

5.5.5 The Shortlisted options were taken forward to public consultation. As a result of the Covid-19 pandemic, the consultation took place digitally via Oxfordshire County Council's Consultations Home webpage between 19th March and 9th April 2021. The outcome of the public consultation fed into the scoring of the Shortlisted options and the development and identification of the Refined Preferred Option.

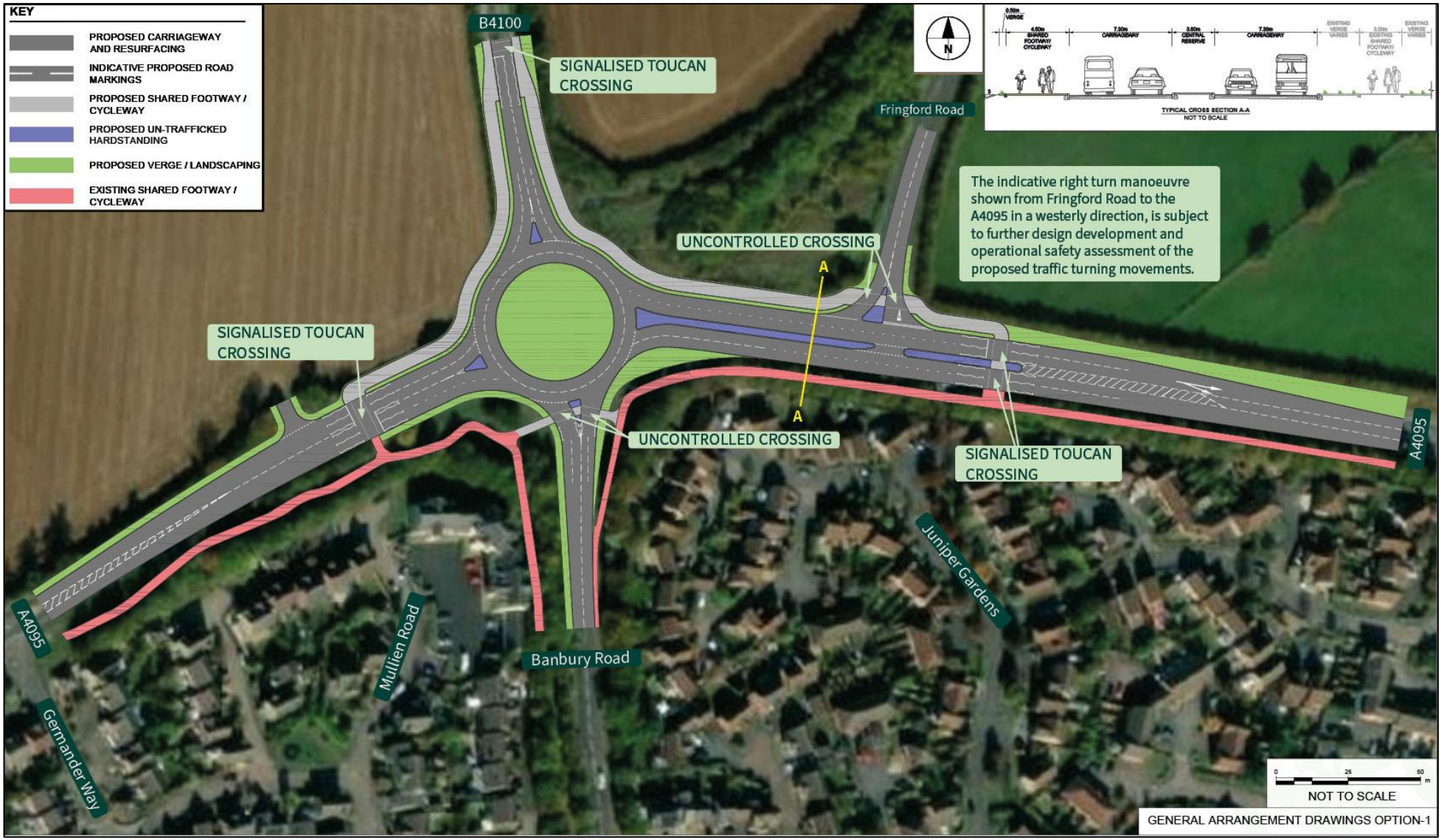

Figure 28. Option 1 Drawing – Higher Capacity Roundabout

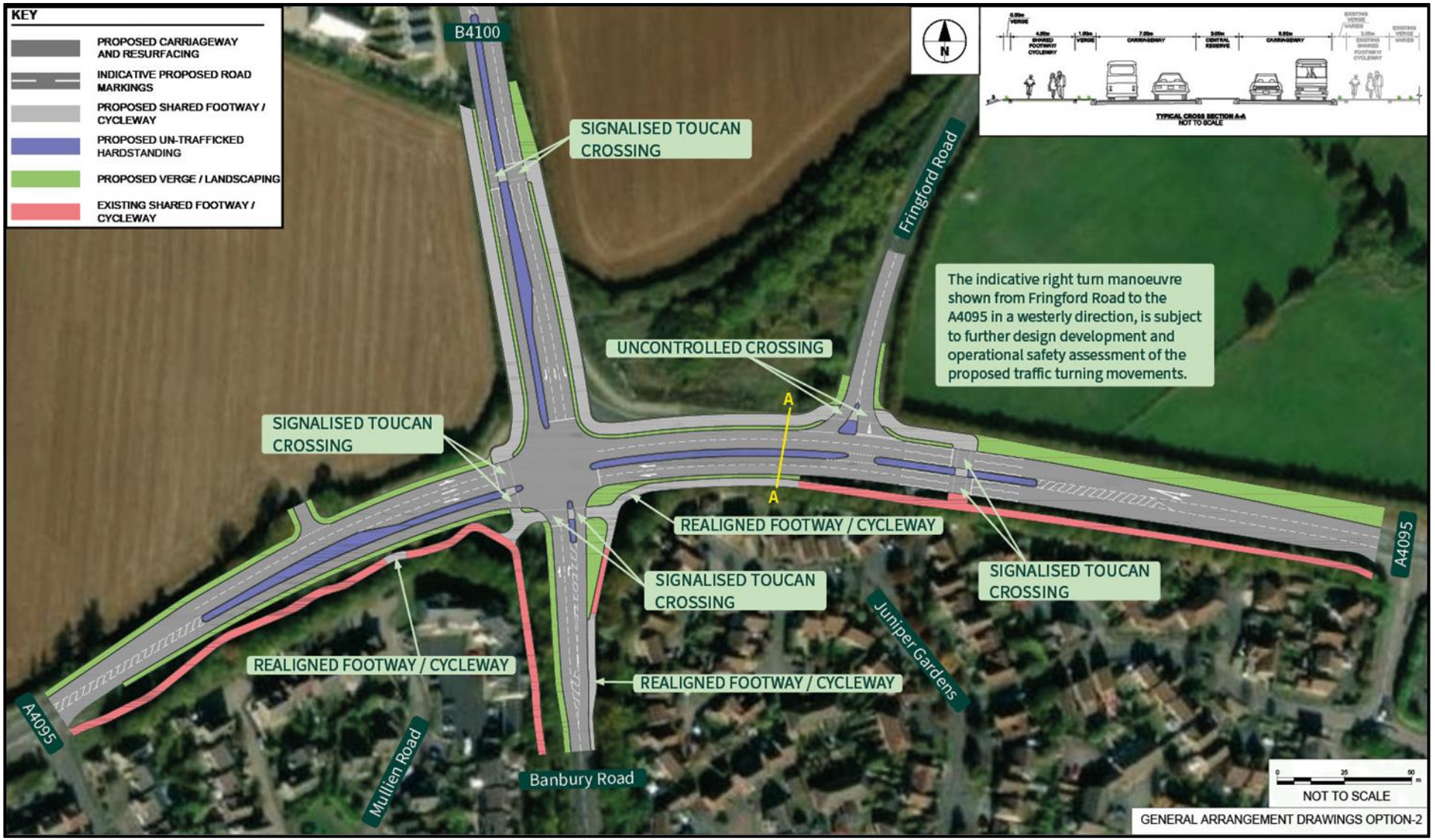

Figure 29. Option 2 Drawing – Signalised Junction

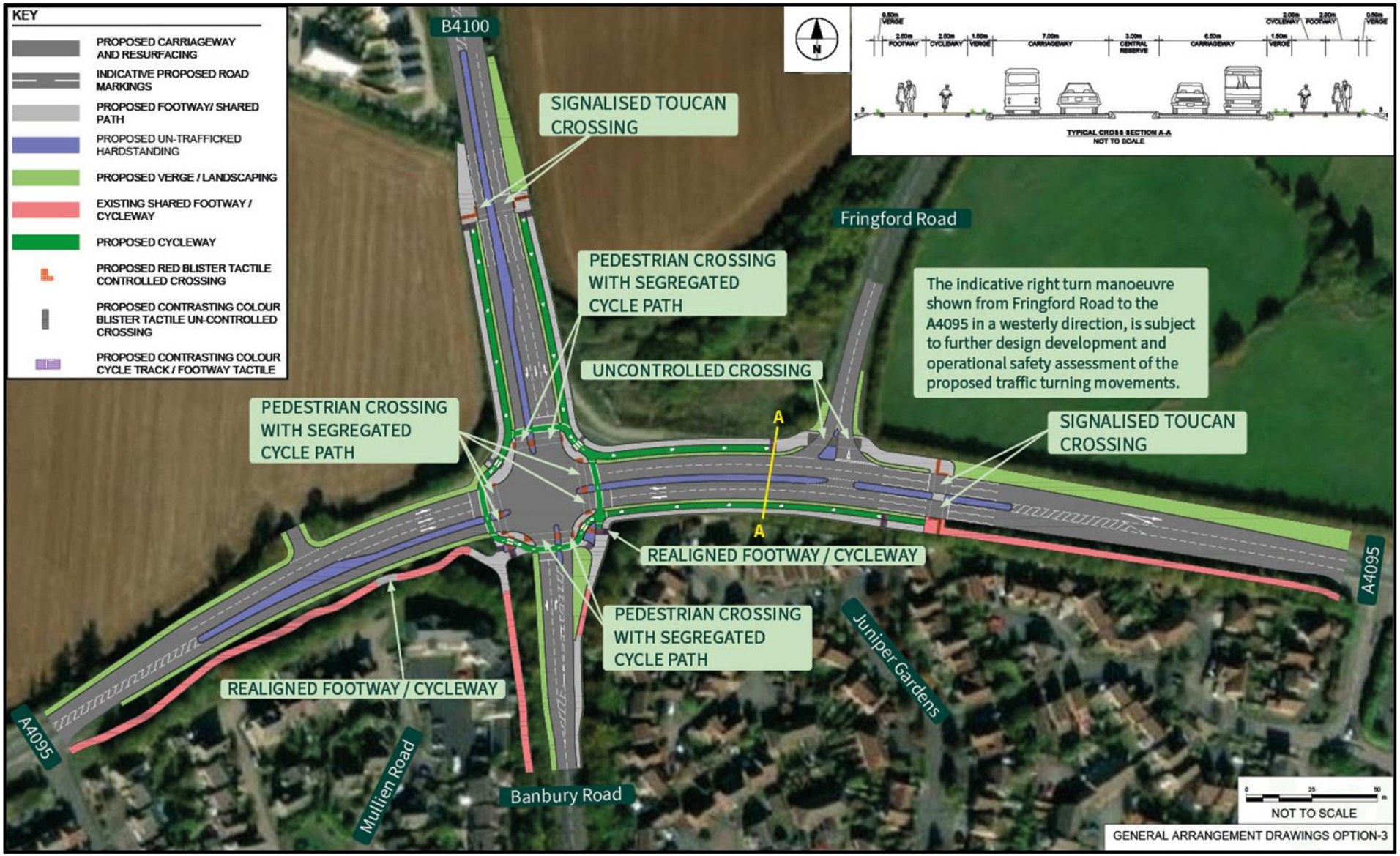

Figure 30. Option 3 Drawing – CYCLOPS Junction

Sift 2 Input

5.5.6 This section discusses the evidence and approach used to score the three Shortlisted options. More details on the outcome of Sift 2, including tables of the scores against each criterion, are provided in Appendix D.

Transport Planning

5.5.7 The transport planning team conducted its scoring of the three Shortlisted options based on the following evidence:

- Qualitative appraisal using the option layouts and professional judgement; and
- Sift 2 input provided by the other disciplines.

5.5.8 Transport planning input was required for the strategic case criterion 'S1. Project objectives'; and the economic case criteria 'E2. Impact on the environment' and 'E3. Impact on society'.

5.5.9 Two of the project objectives (under strategic case criterion 'S1. Project objectives') were scored by the transport planning team, specifically project objective #3 around mitigating the impact of vehicular traffic on communities and the urban environment, and objective #6 about reducing the dangers associated with travel. These objectives were scored based on sift 2 input provided by the environment and highways design teams, respectively.

5.5.10 A qualitative appraisal of the likely impact of the options on objective #3 was based on the scores for the economic case criteria of noise (both construction and operational impacts), air quality, landscape and streetscape. Option #1 was given a positive score as it is expected to see lower levels of noise during operation and have positive impacts in terms of air quality since the carriageway is potentially further away from residential properties to the south of the junction. Options #2 and #3 were given neutral scores and therefore scored worse compared to Option #1. For Option #2, this was as a result of a potential increased exposure to pollutants for the residential properties to the south of the junction and expected negative impacts on streetscape. The potential for increased exposure to pollutants is expected for Option #3 as well, in addition to further negative air quality impacts as a result of reduced vehicle capacity.

5.5.11 Project objective #3 around safety and collision risks was scored based on the scoring for criterion 'E3.3 Accidents' (see paragraph 5.5.42).

5.5.12 Criterion 'E2.5 Streetscape' was informed by professional judgement, specifically considering the option design features and the expected future vision of the local area. Option #3 scored best given its visual design emphasis on active travel, whereas Option #1 was given a neutral score based on its close resemblance to the existing conditions in the study area. Option #2 was given a neutral score as it increases the amount of paving.

5.5.13 Criterion 'E3.2 Physical activity' was also informed by professional judgement, specifically the level of active mode provision in the option designs and the expected impact on levels of active travel. Options #2 and #3 both received positive scores, +1 and +2 respectively, given that they significantly improve pedestrian and cyclist facilities and therefore may encourage active travel. Option #1 was given a neutral score as it does not significantly improve active mode provision.

5.5.14 Finally, criterion 'E3.4 Severance' was scored based on the level of provision for pedestrians and cyclists compared to existing conditions. Options #2 and #3 scored

positively given improved crossing facilities at desire lines, whereas Option #1 was given a neutral score as travel distances to crossings remain the same.

Traffic Modelling

5.5.15 The three Shortlisted options were modelled using micro-simulation Vissim software. A summary of the modelling approach and results is presented here, with more detailed information provided in the Local Model Validation Report and Vissim Forecast Technical Note (AECOM, 2021).

5.5.16 The modelled study area is presented in Figure 31. A base model was developed, calibrated and validated of the existing situation in 2019. The forecast traffic demand in the models has been derived from the 2031 Bicester Transport Model and the information included in the Transport Assessment for the Future Automotive Speed & Technology (FAST) development. The forecast pedestrian and cycle demand has been calculated based on the information provided in the Transport Assessment for the North West Bicester and FAST developments, as provided by OCC.

5.5.17 The modelling work for transport interventions requires a test of future benefits and disbenefits. The assessment of the Shortlisted options needed to test the year of opening and a future year to provide confidence in its continued resilience. Forecasts are uncertain given the strong emphasis on Zero Carbon and Climate Change, but it is clear that expected travel patterns are expected to change.

5.5.18 The options have been tested up to the end of the Local Plan period at 2031 using the District Council's housing trajectory, and trip rates and mode share used for the North West Bicester Transport Assessment. As the opening year for the Scheme is 2022 the future appraisal year should be 2037 - 15 years beyond opening. However, it is not considered appropriate to use the previously agreed trip rates and mode share this far into the future as they have the potential to change over time. The County's new strategic model will help to set the future trip rates and mode share but that is not available currently. Therefore Oxfordshire County Council has agreed that the modelling should use 2031 vehicle trips (the end of the Local Plan period where we have more certainty over growth trajectories and can use a worst case scenario in terms of the vehicle trips) but an uplift to 2037 pedestrian/cycle trips to reflect the expected uplift from the now approved Bicester Local Cycling and Walking Infrastructure Plan (LCWIP)[18]. This helps to show to some constraint on vehicle trips in the future, ahead of any policy and future modelling advice.

[18] The Bicester Local Cycling and Walking Infrastructure Plan (LCWIP) (2020) sets the target of at least a 200% increase (tripling) in cycling and a 50% increase in walking trips in Bicester by 2031, based on 2020 levels. See Section 2.3.1 for more information.

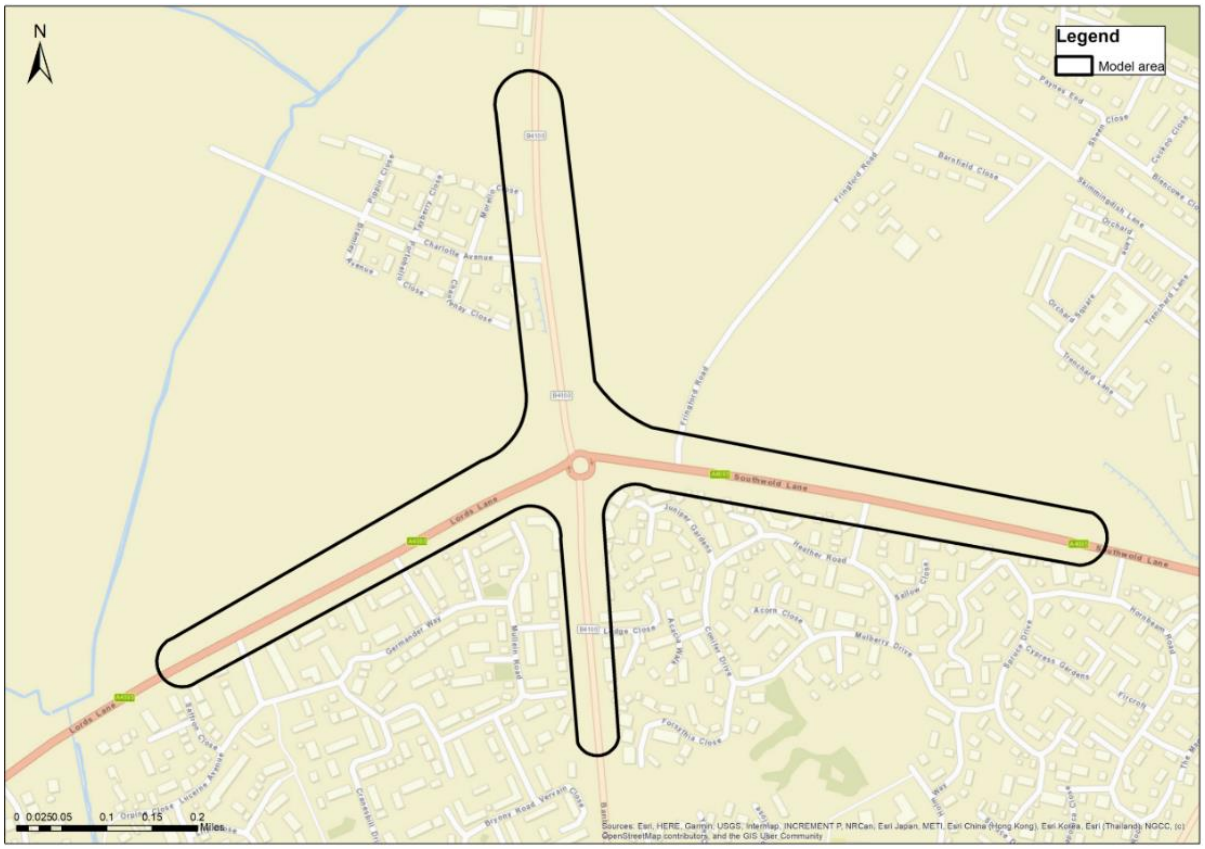

Figure 31. Modelling Study Area

5.5.19 Overall, Options #1 and #2 increase capacity for motorised traffic compared to the Do Minimum scenario. This leads to improved journey times and reduced levels of congestion in both options. The overall reduction in delay is of a similar magnitude across the two options. Option #3, however, reduces capacity for motorised traffic compared to the Do Minimum scenario, and therefore results in longer journey times and higher levels of congestion. This is a result of the all-red signal stage for motorised traffic, required to facilitate the cycle and pedestrian movements across all arms.

5.5.20 In terms of pedestrians and cyclists, all options reduce overall delay compared to the Do Minimum scenario. Options #2 and #3 see a somewhat larger reduction in delay for pedestrians compared to Option #1, and this is also the case for Option #2 in terms of cyclist delay. However, Option #3 does not reduce delay for cyclists more than Option #1 despite providing crossing facilities for cyclists on all arms of the junctions. This is because the one-way circulatory cycle track requires cyclists to cross more than one arm for certain key movements, such as the north to south movement along the shared use path on the western side of the B4100 and Banbury Road. The modelling of Option #3 has considered the optimal routing for cyclists through the A4095 / B4100 Banbury Road junction, with more information provided on the methodology and results of the modelling within the Vissim Forecast Technical Note (AECOM, 2021).

5.5.21 AECOM conducted the scoring of the three Shortlisted options based on the forecast Vissim modelling results, specifically average delay results, journey time changes, and speed plots showing average delay across the network.

5.5.22 Modelling input was required for the strategic case criterion ‘S1. Project objectives’; and the economic case criteria ‘E1. Impact on the economy’ and ‘E2. Impact on society’. The modelling results for each of the Shortlisted options were compared against the Do Minimum scenario, with a positive score given if the option performed better than the Do Minimum scenario, and a negative score if it performed worse.

5.5.23 Four of the project objectives (under strategic case criterion 'S1. Project objectives') were scored based on the modelling results. Project objective #1 around supporting growth (see Table 8) assumes that road capacity improvements are more likely to support growth in the context of this Scheme. As Options #1 and #2 improve capacity compared to the Do Minimum scenario, they both received a positive score for this objective. Project objective #2 is about addressing forecast congestion issues at the junction and therefore scores in line with objective #1, based on the modelled delay results.

5.5.24 Project objective #4 focusses on town-wide carbon emissions and assumes that an increase in highway capacity raises the potential of induced travel, which could lead to more carbon emissions. It also assumes that options which encourage travel by sustainable modes would reduce carbon emissions. As Option #1 does not significantly improve provision for pedestrians and cyclists, and also increases capacity for motorised traffic, it scores negatively for this objective. While Option #2 does improve active mode provision, the highway capacity improvements are still considered likely to lead to induced travel, and therefore it receives a negative score, although less negative than Option #1 given improvements for pedestrians and cyclists. Option #3 both reduces highway capacity and improves active mode provision and therefore scores positively. It should be noted that while objective #4 is about town-wide emissions, the 'E2. Impact on the environment' criteria around air quality and greenhouse gases, as well as project objective #3, look at emissions-related impacts in the study area of the Scheme. The differential scoring between objective #4 and the beforementioned criteria is therefore a result of assessing emissions at different scales.

5.5.25 Project objective #5 aims to encourage sustainable travel and was scored based on the level of sustainable travel provision and modelled delay results for pedestrians and cyclists. All options reduce delay for active modes and therefore received positive scores. However, Options #2 and #3 also significantly improve crossing facilities for pedestrians and cyclists and therefore score better than Option #1.

5.5.26 The economic case criteria 'E1.1 Business users, freight, and transport providers' and 'E3.1 Non-business users including commuters and leisure/education' were scored based on modelled travel time changes. While Options #1 and #2 improved travel times for private motorised vehicles because of decreased congestion, Option #3 conversely worsened congestion and thus travel times. Therefore, Options #2 and #3 were given positive scores for these criteria whereas Option #3 got a negative score. In terms of travel times for buses, Options #1 and #2 remained consistent with the Do Minimum scenario, thereby receiving neutral scores, whereas Option #3 saw increased bus travel times as a result of increased congestion. This lead to Option #3 receiving a negative score for bus travel times. It should be noted that, due to the low bus service frequency and the high levels of congestion at the Banbury Road junction, the signalised options (Options #2 and #3) have not been tested with signal priority for buses. However, if a signalised option is taken forward, signal priority for buses would be an option in the future given that there is sufficient demand to support it.

5.5.27 Since Option #1 does not significantly shorten travel distances for active modes nor significantly improves crossing facilities, travel times for pedestrians and cyclists remained consistent with the Do Minimum scenario, thereby receiving a neutral score. Option #2, however, provides signalised crossing facilities at the junction which allow pedestrians and cyclists to cross once the signal stage is triggered. Therefore, Option #2 improved travel times for both pedestrians and cyclists and received a positive score

for these criteria. While Option #3 improves travel times for pedestrians for the same reasons as Option #2, it does not improve travel times for cyclists due to the one-way circulatory cycle track. Therefore, Option #3 received a positive score for pedestrian travel times and a neutral score for cyclist travel times.

5.5.28 The economic case criterion 'E3.5 Accessibility – access to the road/infrastructure for residents/land owners' was scored based on modelled speed plots. Speed plots show average delay across the network and were used to represent queueing. Both Options #1 and #2 reduce queueing across the network compared to the Do Minimum scenario which improves access to and from nearby junctions. They were therefore both given positive scores, however, Option #2 received a higher positive score since signalisation provides greater adaptability to changes in future flow patterns, thereby allowing for a balancing of delay across the approaching arms. Option #3 received a negative score because of increased queueing compared to the Do Minimum scenario which blocked back to nearby junctions, thereby restricting access.

5.5.29 As a result of feedback from the public consultation, a theoretical sensitivity test was undertaken of the CYCLOPS option to investigate the impact of introducing two-way segregated cycle crossings at the Banbury Road junction. While the test demonstrated a small improvement for cyclists in terms of decreased delay, the levels of delay for motorised traffic remained consistent with the assessed CYCLOPS option (Option #3). Therefore, the theoretical CYCLOPS also operates significantly above capacity for motorised traffic. In this way, this theoretical test also reinforced the relative performance of the three Shortlisted options.

Environment Input

5.5.30 The environment team conducted its scoring of the three Shortlisted options based on the following evidence:

- Qualitative appraisal using the option layouts and professional judgement;
- Ecological and site surveys; and
- Desk study.

5.5.31 Environmental input was required for the economic case criteria 'E2. Impact on the environment'.

5.5.32 For noise, the construction and operation of any of the three options is unlikely to give rise to significant noise effects. Based on the traffic modelling, Options #1 and #2 would facilitate smoother traffic flow with corresponding higher average traffic speed which could lead to slightly higher traffic noise levels at local receptors. However, at this stage it is anticipated that the effect would not be significant.

5.5.33 For air quality, there is the potential for impacts on sensitive receptors due to dust and vehicle emissions during construction for all options, but these will be temporary in nature. Option #3 will likely push the junction closest to residential receptors and therefore, construction impacts may be worse than Options #1 and #2. Levels of air quality in the area are good and are below the relevant objectives, so it is unlikely that there will be any significant effects on air quality for any of the three options. However, the increase in vehicle capacity due to the proposed roundabout, included in Option #1, will potentially lead to a smoother traffic flow with higher traffic speeds and therefore, potentially lower emissions and pollutant concentrations. Option #2 will also see smoother traffic flows in relation to the current conditions but is outperformed by Option #1 in this regard, as there will be signalisation, and priority will be given to buses

and non-motorised users. Option 3# will further favour priority for buses and non-motorised users over Option #2.

5.5.34 For greenhouse gases, Option #1 would provide increases in vehicle capacity due to the proposed improvement at the junction with the potential for smoother traffic flows with higher speeds and therefore potentially lower emissions and pollutant concentrations. The signalisation of the junction as part of Options #2 and #3 will lead to less smooth traffic flows and will reduce vehicle capacity compared to Option #1, but they would promote cycle use and may therefore encourage more sustainable travel.

5.5.35 For landscape impacts, given the similarities between the options, it is anticipated that the impact for all three options would be similar in magnitude. Options #1 and #2 have been given a score of -1 due to their impact on hedgerows and trees, which has the potential to create more open views of the junction. Option 3# has been given a score of -2 as it has the greatest footprint and therefore, has the potential for the greater impact on hedgerows and trees reducing screening of the junction and creating views towards it.

5.5.36 For historic environment, given the scope and scale of the proposed development, it is anticipated that the impact for all three options would be approximately similar, and have been given neutral (0) scorings, reflective of the fact that there is no element of the Options that would be precluded by the known heritage resource, but that the Options do not in any particular way benefit the heritage resource of the Site and surrounding area.

5.5.37 For biodiversity, all Options would result in the loss of sections of hedgerow and individual trees; and unlikely to impact protected or notable species and habitats and designated nature conservation sites; however, relevant ecology surveys will be undertaken where required to determine the likelihood of impacts.

5.5.38 Finally, for water environment, all options are located in Flood Zone 1 and would cross small area of low surface water flood risk on the existing A4095 carriageway, east of the roundabout. Surface water runoff would be managed through implementation of a drainage strategy to prevent any increase in flood risk in the receiving watercourse. All options would lead to an increase in impermeable area in comparison to the existing situation which would increase runoff and require attenuation to prevent flooding and water quality deterioration in the receiving watercourse.

Highways Design Input

5.5.39 The highways design team has conducted its scoring of the Shortlisted options based on the following:

- The general arrangement drawings for each option; and
- Professional judgement, knowledge and application of the Design Manual for Roads and Bridges (DMRB).

5.5.40 Highways design input was required for the economic case criteria ‘E3. Impact on the economy’ and ‘E3. Impact on Society’; management case criterion ‘M1. Practical feasibility’; and commercial case criteria ‘C1. Complexity of delivery’ and ‘C2. Flexibility’.

5.5.41 The economic case, under the sub-criteria of ‘E1. Impact on economy’, requires assessment of the impacts of the scheme on motorised traffic and, separately, impacts on pedestrians and cyclists. The assessments take into account the relative complexity of the option, how much of the scheme can be built off-line from the existing road

layout, expected construction period and how easy it should be to provide alternative routes to maintain traffic flows for all modes of travel. Overall, Option #1 scores highest on the basis that it should be the most straightforward to build, involves using the least technology and large sections can be built offline from existing for all modes of travel compared to other options.

5.5.42 The economic case, under the sub-criteria of 'E3. Impact on society', requires commentary on criterion 'E3.3 Accidents'. The qualitative assessment provided is based on professional judgement, type and complexity of the junction options, familiarity of layout to drivers, expected need for Departures and Relaxations from Standards, degree of control of traffic movements and potential conflict points between the different modes of travel. Option #3 scores the highest due to high degree of control of the traffic flow through traffic signals. Option #1 scores the lowest due to lack of traffic control at conflict points between different modes of travel and the likelihood of higher vehicle speeds in a layout that would be generally familiar to UK drivers.

5.5.43 The management case, under the sub-criteria of 'M1. Practical feasibility' identifies, three criteria where highways design team assessment is required, covering engineering aspects, construction and stakeholder impacts. The qualitative assessment is based on professional judgement, application of and compliance with design standards, ease of providing traffic management during construction, potential scheme delivery phasing and operation of the junction. Overall, Option #1 scores highest as this is expected to be the simplest to design, quickest and easiest to build and involves the least amount of technology, although a higher scheme footprint is expected than other options. Option #3 scores the lowest because it involves the most complex technology which will take the longest to build and commission. All options are considered to have the same future proofing ability if additional capacity is required at a later stage.

5.5.44 The commercial case, under the sub-criteria of 'C1. Complexity of delivery', identifies four criteria where highways design team assessment is required, covering commercial risks in delivery in terms of timescales, technical work and contracts. The qualitative assessment is based on professional judgement and knowledge of similar schemes. Overall, Option #1 is considered to be marginally better than other options for highways design because it is the simplest to design and construct and has the lowest expected level of risk. In terms of design of pedestrian and cyclist facilities, Options #1 and #2 score better as they are considered to involve standardised road crossings with average level of complexity and risk.

5.5.45 The commercial case, under the sub-criteria of 'C2. Flexibility', covers criterion 'C2.1 Possibility to change option – option flexibility'. The qualitative assessment is based on professional judgement on how the scheme could be delivered in stages or be changed from one junction type to another, if the need arises, at a later stage in scheme development. Overall, all options are considered to have similarly low levels of option flexibility.

Cost Estimation Input

5.5.46 The estimating team conducted its scoring of the three Shortlisted options based on the general arrangement drawings as listed below:

- 60650764-ACM-GEN-ZZ-TM-IM-000001 – Option 1 - Higher Capacity; Roundabout
- 60650764-ACM-GEN-ZZ-TM-IM-000002 – Option 2 – Signalised Junction; and

- 60650764-ACM-GEN-ZZ-TM-IM-000003 – Option 3 – CYCLOPS Junction.

5.5.47 In addition to the general arrangement drawings, the Stage 1 Option Estimates were also used.

5.5.48 A high level (order of magnitude) estimate for each option was produced based on the general arrangement drawings detailed above, producing bill of quantities based upon the Method of Measurement of Highway works Volume 4 Section 1 May 2009. Rates were derived from Spon's 2021 Civils and Highway price book or where these were known not to reflect current market rates, rates were used based on various recent Highway infrastructure projects. The estimates were produced according to Highways of England PFC Stage 0 – Strategy, Shaping and Prioritisation criteria. Utilising the project option cost summary from the Estimate, the total scheme cost per option was used to inform the scoring.

5.5.49 The cost estimates and Sift 2 appraisal were undertaken based on the information available at that time.

5.5.50 Cost estimates informed the scoring of the financial case criteria 'F1.1 Infrastructure capital cost, operating and maintenance cost'. The lowest capital cost option was estimated for Option #1 at £15.3M. The bill items for Option #1 were estimated to be lower in quantity than the other two options, as the overall cost for road and technology infrastructure required is considered to be less. Therefore, it was assumed that operating and maintenance costs would be lower compared to the operating expenditure of the two other options. Whole life costing was not conducted in the estimates.

5.5.51 Option #2 had an estimated value of £17.9M and was assumed to have higher operating and maintenance costs over Option #1.

5.5.52 Option #3 had an estimated value of £19.8M and was assumed to have higher operating and maintenance costs over both Options #1 and #2, given that the overall cost for road and technology infrastructure was higher than the other two options.

5.5.53 Although the three options have different cost estimates, all three Shortlisted options were considered to be relatively expensive and were therefore given a score of -2 for 'F1.1 Infrastructure capital cost and maintenance'.

5.5.54 At the time of the Sift 2 assessment, the cost estimates of all Shortlisted options were thought to be potentially in excess of the available funding and this was reflected in scoring of 'C3. Funding and Income' for which all options scored -2.

5.5.55 In relation to 'F1.1 Infrastructure capital cost and maintenance' and 'C3. Funding and Income', it should be noted that further work is being undertaken to clarify key assumptions and costs, which is expected to result in an overall reduction in capital cost of the Refined Preferred Option; and that OCC have confirmed that initial funding will be provided by the Ministry of Housing, Communities and Local Government (MHCLG) and further funding will be sought from developer contributions and the MHCLG at each stage of the project as it develops.

Public Consultation Input

5.5.56 The Shortlisted options were taken forward to public consultation. As a result of the Covid-19 pandemic, the consultation took place digitally via Oxfordshire County Council's Consultations Home webpage between 19th March and 9th April 2021. In addition, the following five briefing sessions were held over Microsoft Teams with

Councillors and key stakeholders to share further details about the project and take question:

- The first briefing session was held on 24th March 2021 and was attended by 15 consultees, including County Councillors, District Councillors, Parish Councillors, and representatives from Stagecoach, Grayline Coach and Bicester Bike Users Group;
- Three briefing sessions were held for County Councillors on 19th April, 21st April and 11th June 2021; and
- A final briefing session was held on 16th June 2021 which was attended by District Councillors and representatives from Stagecoach, Grayline Coach, Bicester Bike Users' Group, Oxfordshire Cycling Network and representatives of local landowners and developers.

5.5.57 A summary of the public consultation is provided in paragraphs 5.5.58 to 5.5.65; further details are provided in the Statement of Community Involvement (AECOM, 2021).

5.5.58 During March and April, 496 pieces of feedback were received. Of these, 475 were received via the online feedback form, two hard copies of the feedback form were received and 27 were received via email or phone. As shown in Figure 32, the consultation responses favoured Option #1 as the preferred junction improvement. Based on the consultation responses, 50% preferred Option #1, followed by 28% for Option #3 and 11% for Option #2. A total of 11% of the responses were not sure or did not prefer any of the options.

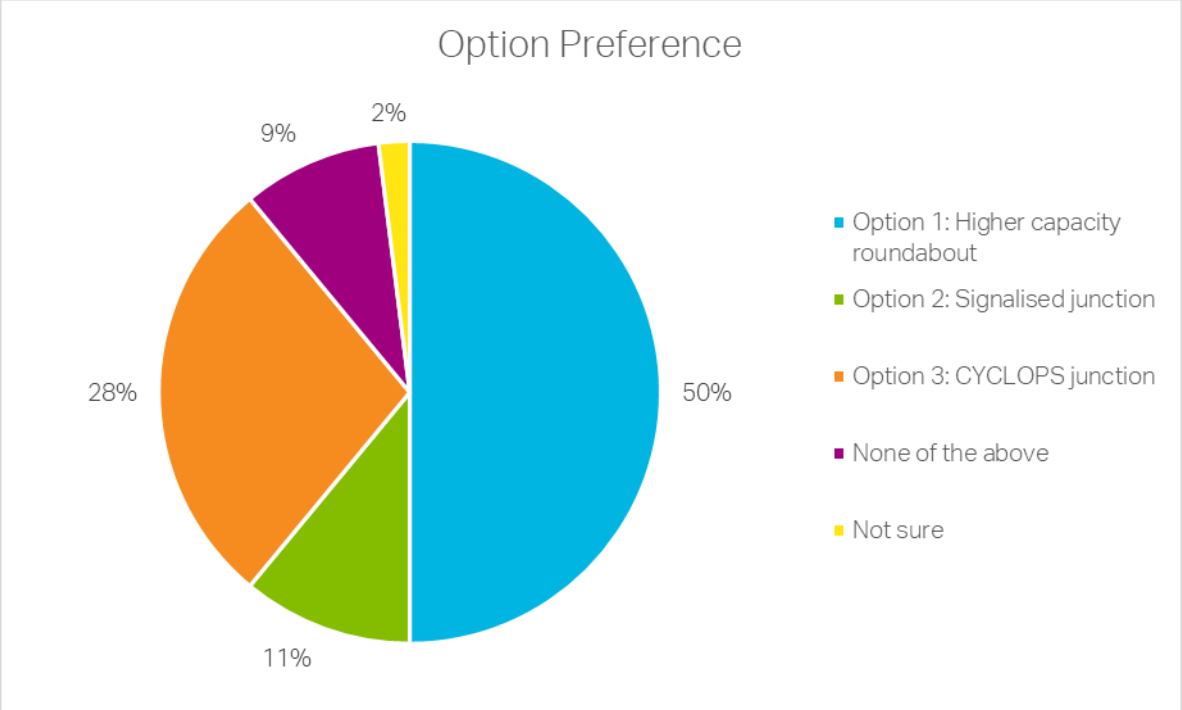

Figure 32. Public Consultation – Option Preference

5.5.59 Option #1 was favoured based on the perception that it would maintain traffic flow and cause the least congestion, and therefore lead to less air, traffic and noise pollution. The majority of respondents who opted for Option #1 used the Banbury Road roundabout more than once a week. Local residents favoured this option as it was perceived to not encroach on existing tree lines and noise barriers.

5.5.60 Respondents who opted for Options #2 and #3 did so based on the perception of the options encouraging active travel and prioritising cyclists and pedestrians. In total, 39% of respondents preferred Options #2 or #3. Concerns were raised about the impact of

adding traffic light signals on the flow of traffic, and the risk that it would lead to more congestion and therefore greater air pollution. Option #3 was favoured most by respondents who used the Banbury Road roundabout less than once a week.

5.5.61 It should be noted that some of the concerns raised by the consultation respondents are not supported by the technical assessments undertaken of the three Shortlisted options. The consultation identified that many respondents perceived Option #1 to provide more road capacity than the other options, and that the signalised options (Options #2 and #3) would limit capacity due to the nature of signal controlled junctions. The modelling undertaken of the Shortlisted options does not support these concerns. As discussed previously, the modelling demonstrated that both Options #1 and #2 increase capacity for motorised traffic compared to the Do Minimum scenario. This leads to improved journey times and reduced levels of congestion in both options. The overall reduction in delay is of a similar magnitude across the two options. Option #3, however, reduces capacity for motorised traffic compared to the Do Minimum scenario, and therefore experiences longer journey times and higher levels of congestion. This is primarily a result of the all-red signal stage for motorised traffic required to facilitate the cyclist movements.

5.5.62 More detailed information in regard to the key concerns raised in the consultation is provided in Table 19, where it is also discussed how the concerns have been addressed in the optioneering to date.

5.5.63 The outcome of the public consultation informed the scoring of two management case criteria: ‘M2. Stakeholder acceptability’ and ‘M3. Public acceptability/interest’.

5.5.64 Stakeholder acceptability was scored based on the responses and feedback received from stakeholders, both through the online consultation and the stakeholder briefing sessions. The majority of stakeholder responses to the consultation preferred Option #3, leading to it getting a high positive score. Option #1 also received a positive score, although lower than the score for Option #3, as a small minority of stakeholders preferred Option #1. No stakeholder responses preferred Option #2.

5.5.65 Public acceptability/interest was scored based on the outcome of the public consultation and therefore scores in line with the results presented in Figure 32: Option #1 got the highest positive score, followed by a lower positive score for Option #3, and a neutral score for Option #2.

Table 19. Public Consultation Responses – Key Concerns

Key Concerns	Scheme Response
Speed limits – there was a general consensus in the public consultation responses that speed limits near the Banbury Road junction should be lowered	As a result of the A4095 Realignment scheme and the North West Bicester development, the nature of the A4095 is expected to change into a more residential urban environment in the future. This is expected to result in a reduction in speeds at and around the Banbury Road junction. To reflect this, it is assumed that a 30 mph speed limit would be introduced as part of the Scheme. The reduced speed limit was incorporated in the assessment of the Shortlisted options and will also be taken forward in the further appraisal of the Preferred Option.
Environmental impact – the chosen junction improvement should minimise impact on the environment including loss of trees and minimal traffic and air pollution	The Shortlisted options were assessed against their expected impact on the environment in Sift 2, as discussed in more detail in paragraphs 5.5.30 to 5.5.38. Based on the qualitative assessment undertaken, all three options are expected to have a neutral or positive impact on the environmental criteria of noise, greenhouse gases, historic environment and biodiversity. Options #1 and #2 are expected to have a neutral or positive impact on air quality, whereas Option #3, given the reduction in capacity for motorised traffic, is expected to have a negative impact. In terms of likely impact on streetscape, Options #1 and #3 are expected to have a neutral or positive impact, whereas Option #2 is expected to have a negative impact given the increased amount of paving needed. All three options are expected to have a negative impact on landscape and water environment. However, it should be noted that the assessment was done based on pre-mitigation conditions and that some of the likely negative impacts could be mitigated. More detailed impact assessments for the relevant environmental factors will be undertaken for the Preferred Option to be submitted for Planning. The design of the Scheme has sought to limit its impact on the environment, and where possible, design avoidance measures and embedded mitigation have been considered to reduce the likelihood of environmental impacts. Where impacts are unavoidable, mitigation, compensation and were possible, areas to be enhanced will be proposed. Further information on mitigation is provided in the Arboriculture Impact Assessment, Tree Protection Plan and the Landscape Design. There are no sensitive wildlife sites that would be impacted by the Scheme.
Congestion – the chosen junction improvement should minimise traffic congestion and ensure vehicles can continue to move through the junction without delay	Addressing the forecast levels of congestion at the Banbury Road junction is one of the project objectives of the Scheme against which the Shortlisted options have been assessed. Options #1 and #2 increase capacity for motorised traffic compared to the Do Minimum scenario. This leads to improved journey times and reduced levels of congestion in both options. The overall reduction in delay is of a similar magnitude across the two options. Option #3, however,

Key Concerns	Scheme Response
	reduces capacity for motorised traffic compared to the Do Minimum scenario, and therefore experiences longer journey times and higher levels of congestion.
Impact on local residents – respondents who answered as neighbouring residents to the roundabout felt strongly that the chosen improvement scheme should minimise impact on their properties and avoid encroaching on their existing boundaries	The Shortlisted options have been developed in accordance with the design standards required by OCC and used as best practice elsewhere in the UK. For all the options, it is also important to maintain smooth alignment paths appropriate to the speed limit through the junction for motorised vehicles, cyclists and pedestrians. The designs also consider the position of the new road layout relative to the existing kerbs and footways / cycleways and how the changes could impact on the existing vegetation along the A4095 and B4100 at this location. The resulting designs aim, where possible, to avoid moving the kerbs on the south side of the A4095 towards existing houses. Where moving the kerbs towards the existing housing is considered to be required nearer to the junction in order to meet the objectives of the Scheme set out by OCC, the edge of the footways and cycleways nearest to the houses does not move significantly. The result is that in all options, the existing vegetation along the south side of the A4095 and along the B4100 Banbury Road, to the south of the junction, will generally remain, except for some areas where limited cutting back may be required to provide the sight (visibility) lines for all highway users. It is also very important to construct the Scheme in a safe manner, which causes minimal disturbance and disruption to the nearby residents and all users of the public highway. During the construction phase of the Scheme, the contractor will be required to comply with OCC's limitations on noise, vibration, dust, working hours and requirements for traffic management, including restricting routes which can be used for delivery of plant and construction materials to and from the scheme location. The contractor would be required to prepare a Construction Environmental Management Plan which provides details on the management of construction activities to ensure negligible or minimal impact to the environment (including local residents).
Active mode provision – engagement with stakeholders emphasised the need to provide for pedestrians and cyclists at desire lines and to plan for the mode share targets across Bicester and at the North West Bicester development	The forecast pedestrian and cyclist demand used in the modelling of the Shortlisted options meets the mode shift targets set out in the Bicester Local Cycling and Walking Infrastructure Plan (LCWIP). The LCWIP sets the target of at least a 200% increase (tripling) in cycling trips and a 50% increase in walking trips in Bicester by 2031, based on 2020 levels. This has been incorporated in the demand development for the modelling. Analysis of the pedestrian and cyclist demand and movement patterns identified the main desire lines to be the north-south and the east-west movements. These movements would be best supported by direct, signal controlled crossings at the western and southern arms, thereby connecting the off-street shared use paths on the western side of the B4100/Banbury Road and the southern side of the A4095. To accommodate the main desire lines, signalised crossings of the western and southern arms were incorporated where possible in the option designs,

Key Concerns	Scheme Response
	specifically in Options #2 and #3. Due to the potential capacity constraints of introducing signalised crossings close to a non-signalised roundabout, it was not considered feasible to improve the western and southern crossings in the Option #1 design.
CYCLOPS junction – stakeholders requested further refinement of the CYCLOPS junction (Option #3) to include two-way cycle crossings at the Banbury Road junction in line with examples in other European countries, such as the Netherlands	As discussed previously, a theoretical sensitivity test was undertaken of the Option #3 model to test the impact of a two-way circulatory track for cyclists at the Banbury Road junction. The test showed that while delay for cyclists decreased slightly, the high levels of congestion for motorised traffic remained consistent with the Option #3 model. Therefore, the test reinforced the relative performance of the three Shortlisted options in terms of modelling results. It should be noted that this sensitivity test was theoretical since a two-way circulatory cycle path is likely to introduce safety issues, particularly for blind/ partially sighted pedestrians, due to the large number of conflicts between pedestrians and cyclists, across four arms of the junction.
Turbo roundabout – stakeholders requested further consideration of a Turbo roundabout design and clarification regarding why it was not taken forward as part of the Shortlisted options	A separate note has been developed which outlines why a Turbo roundabout design was discounted in Sift 1. This is provided in Appendix E.
Access for local residents – stakeholders highlighted the need to ensure that access to and from the A4095 is maintained for local residents, such as to residential streets to the south of the A4095 and Fringford Road	Access to the road infrastructure was one of the sub-criterion against which the Shortlisted options were assessed in Sift 2. The scoring of this criterion was based on modelling output, specifically modelled speed plots of the three options, which show average delay across the network and are therefore used to represent queueing. Both Options #1 and #2 reduce queueing across the network compared to the Do Minimum scenario which improves access to and from nearby junctions. Option #3, however, increased queueing compared to the Do Minimum scenario which blocked back to nearby junctions, thereby restricting access to and from the A4095.
B4100 southbound bus stop – stakeholders expressed the need of an improved bus stop southbound on the B4100	At the time of writing, there is one bus service using the B4100 southbound bus stop. However, the contract for this service is secured only until 2022 and there is currently no guarantee that this service, or a replacement of it, would continue beyond the start of 2022. As a result, there is no clear need for investment in bus stop infrastructure on the southbound side of the B4100 at this time. At the time of writing it is also believed that the North West Bicester development bus service would operate anti-clockwise around the larger development area in the future, which would then serve the existing Charlotte Avenue bus stop on the B4100. There is consequently no clear requirement for a southbound bus stop on this basis either. As a result, changes to the B4100 southbound bus stop are not currently proposed to be part of this Scheme, but could be explored and accommodated in the future.
Simultaneous Green – stakeholders requested further consideration of a Simultaneous Green phase for cyclists at the junction, which	A separate note has been developed which outlines why a Simultaneous Green for cyclists was not taken forward in the optioneering process. This is provided in Appendix F.

Key Concerns	Scheme Response
would allow cyclists to travel in all directions at once, including diagonally across the junction	

Sift 2 Results

5.5.66 In Figure 33, total scores for each Business Case element for the Shortlisted options are presented. More detailed results for each Business Case element[19] are provided in Figure 34 to Figure 38[20]. Detailed scoring for each sub-criteria is provided in Appendix D.

5.5.67 Figure 33 shows that in terms of overall scores, Options #1 and #2 are the best performing options, having the same overall positive score. Option #2 performed best for the Strategic and Economic Cases, whereas Option #1 performed better for the Management and Commercial Cases.

5.5.68 While no weighting has been applied to the scoring of the criteria, some criteria are considered to be more important than others, for example the project objectives (Strategic Case) and the Economic Case criteria. The project objectives represent the underlying reason for pursuing the Scheme and what it seeks to address, ranging from addressing forecast capacity issues, to promoting sustainable travel, minimising impact on the local environment, and reducing risks of travel (see Table 8 for the project objectives). It is important that the Preferred Option balances these diverse priorities, including balancing the needs of motorised and non-motorised users. Figure 33 and Figure 34 demonstrate that Option #2 best meets the needs of the project objectives. In addition to having the overall highest score for the project objectives, Option #2 also has the lowest number of negative scores against the objectives.

5.5.69 The Economic Case criteria are important too as they demonstrate the options' impact on the economy, the environment and society. Figure 35 shows how the Shortlisted options perform against the Economic Case criteria, demonstrating that Option #2 has the highest overall score, as well as the highest score for two of the Economic Case categories. While Options #2 and #3 have overall negative scores against the category around impact on the environment, it should be noted that some of the negative environmental impacts can be mitigated; the Sift 2 assessment has been based on pre-mitigation conditions, i.e. not considering the extent to which negative impacts could be mitigated and how the options may score following mitigation.

5.5.70 The Financial Case has been scored based on the information available at the time and may be subject to revision (Figure 36). While Option #1 is estimated to be £2.5M lower in value than Option #2, and £4.5M lower in value than Option #3, initial cost estimates at the time were considered to be potentially in excess of available funding.

5.5.71 Figure 37 shows that Option #1 scores best for the Management Case, primarily because it is considered to be less complex in terms of engineering feasibility and is considered acceptable by a high proportion of the public and stakeholders. Option #3 scores well for public and stakeholder acceptability, but is considered to be more technically complex than the other options. Option #2 has a neutral score for the Management Case, indicating no significant expected risks.

5.5.72 The Shortlisted options score consistently across the Commercial Case, with the exception of the criteria around complexity of delivery (Figure 38). While both Options #1 and #2 are considered to involve standard levels of commercial risk, Option #3 is deemed to involve more risk given that its design is more complex. It should be noted

[19] Each Business Case element is made up of the following number of criteria: six criteria for the strategic case; 25 criteria for the economic case; one criteria for the financial case; five criteria for the management case; and six criteria for the commercial case.
[20] Where the total score for a Business Case element is zero, the score will not show in the figures.

that the scoring of the Commercial Case category around funding and income is based on currently available information and may be subject to revision.

5.5.73 Given the importance placed on performance against the project objectives and the Economic Case, Sift 2 identified Option #2 to be the best performing option.

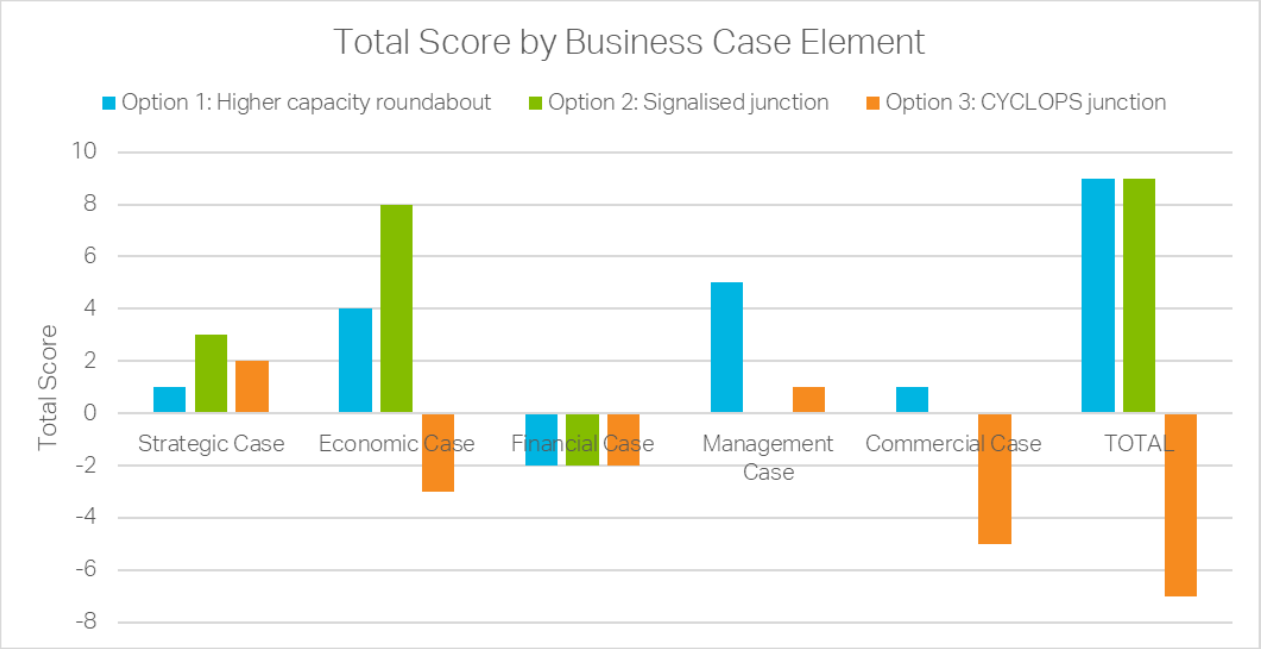

Figure 33. Sift 2 Results – Total Score by Business Case Element

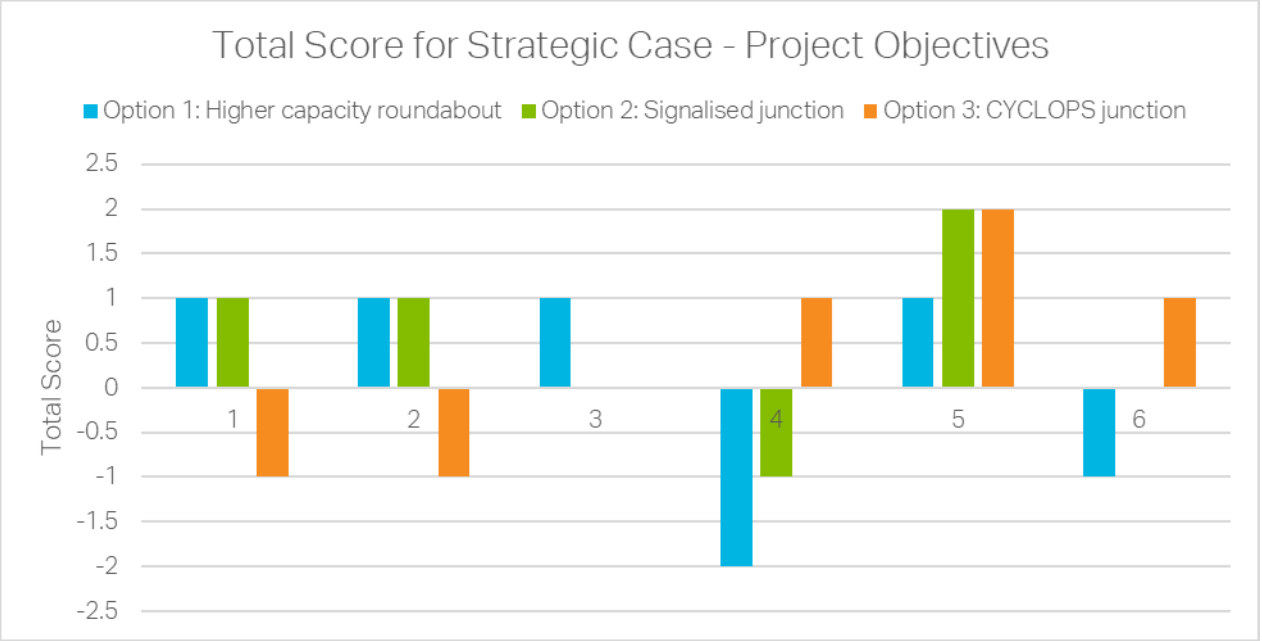

Figure 34. Sift 2 Results – Total Score for Strategic Case

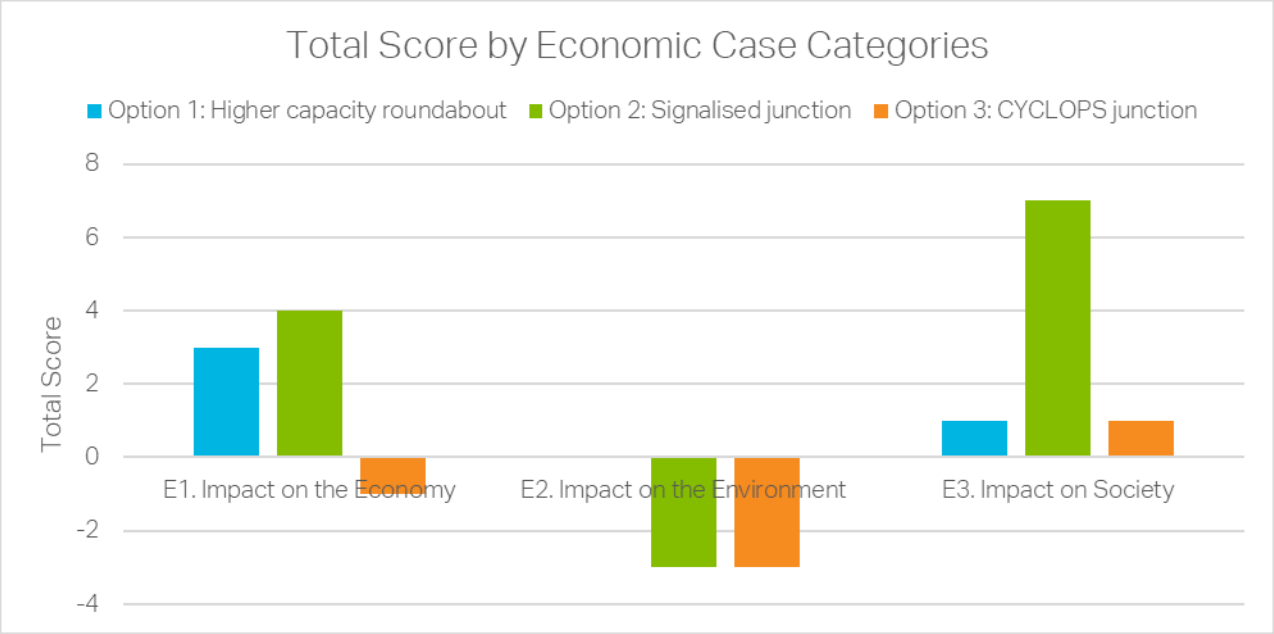

Figure 35. Sift 2 Results – Total Score by Economic Case Categories

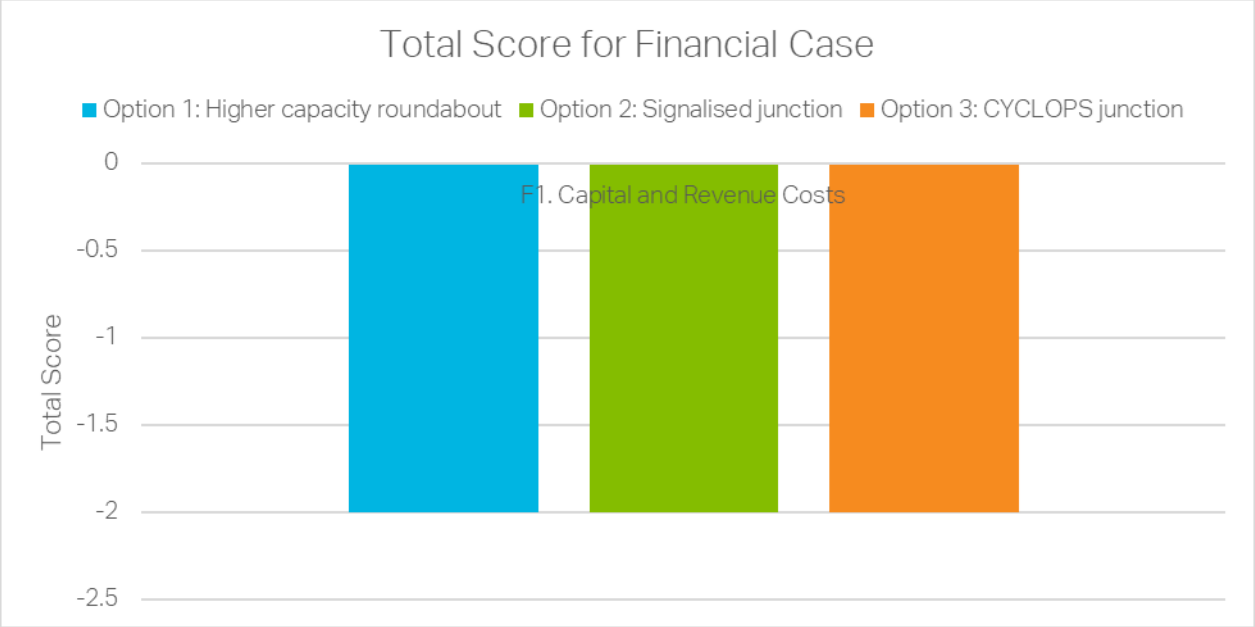

Figure 36. Sift 2 Results – Total Score for Financial Case

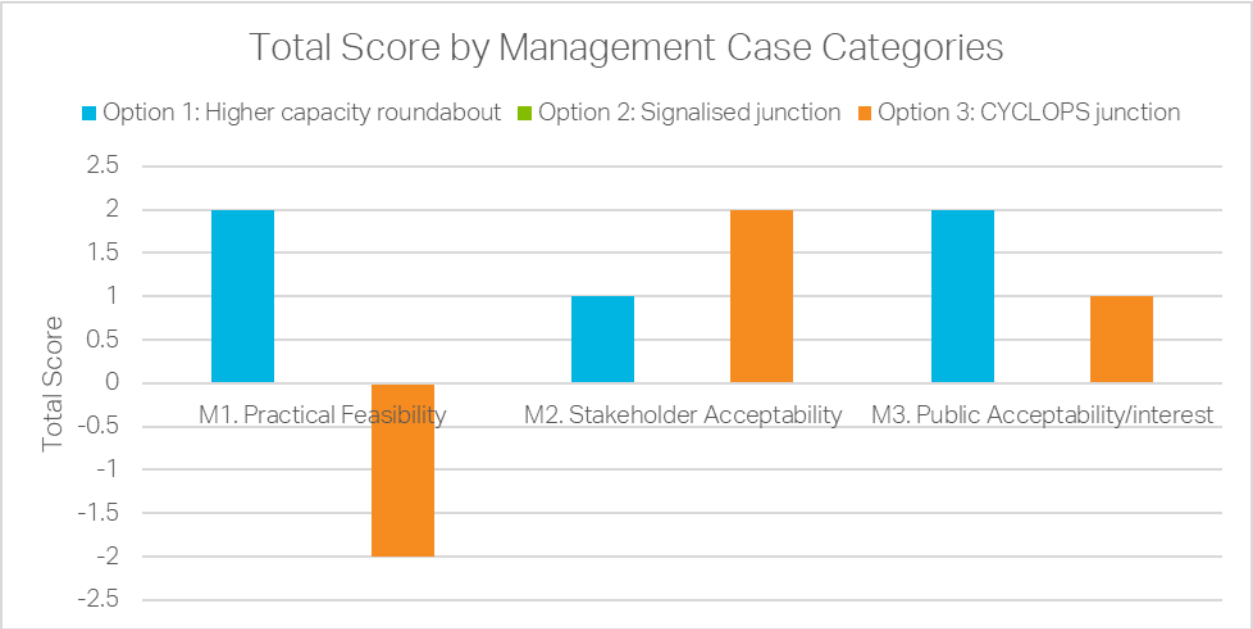

Figure 37. Sift 2 Results – Total Score by Management Case Categories

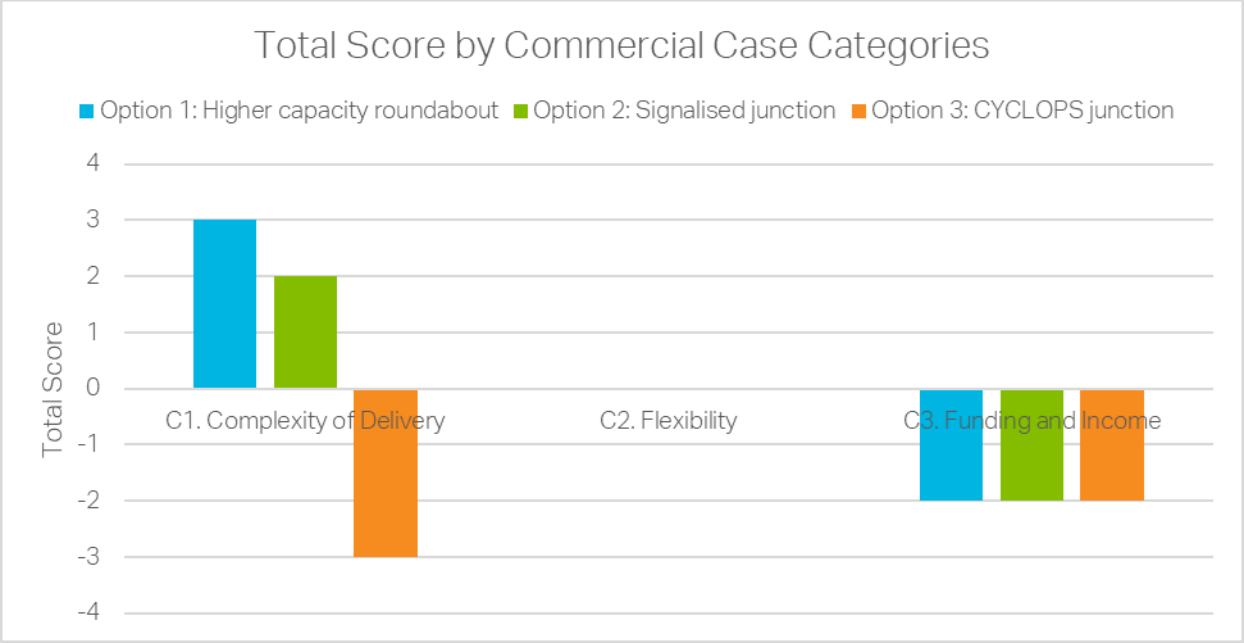

Figure 38. Sift 2 Results – Total Score by Commercial Case Categories

Identification and Refinement of Preferred Shortlisted Option

5.5.74 Following the outcome of Sift 2, Option #2 was identified as the best performing Shortlisted option. Sift 2 shows that in terms of total scores across the business case components, Option #1 and #2 come out equal. However, the best performing option is not necessarily that which has the highest aggregated score. The criteria are not all of equal importance, as some may have been scored with more detailed evidence and some may represent pre-mitigation conditions. It is therefore helpful to look at the variation in scores across the five business case components. Option #2 scores best for the Strategic Case and Economic Case, which include the project objectives, criteria informed by the modelling, and environmental criteria. Importantly, Option #2 scores better for active travel provision. It is important that the Preferred Option balances the needs of both motorised and non-motorised users, thereby reflecting the need to address forecast capacity issues as well as the need to promote more sustainable forms of travel, especially given the policy focus on sustainability across Bicester and at North West Bicester. Option #2 is considered to best balance these different priorities. For the Management and Commercial Cases criteria, where Option #2 scored lower than some of the other options, it received overall neutral scores for both business case elements, thereby indicating that there are no expected significant management or commercial risks. Some of these criteria could also potentially be de-risked.

5.5.75 On this basis, Option #2 was taken forward as the Preferred Shortlisted Option. However, based on feedback from the public consultation, further refinement of the Preferred Shortlisted Option was undertaken to incorporate some of the key concerns and improvements put forward by the public and stakeholders. The Preferred Shortlisted Option was therefore further developed, resulting in a Refined Preferred Option being taken forward to the final step of the sifting process.

5.5.76 Engagement with key stakeholders during the public consultation process identified Option #3 as the preferred option among some stakeholders. A significant minority of the public also opted for Option #3 as their preferred option. This highlighted the support in some sections of the public for further improvements to the pedestrian and cycle provision. Specific improvements were requested, such as providing for pedestrians and cyclists at desire lines, considering two-way cyclist crossings, and greater segregation between pedestrians and cyclists. These are discussed in more detail in Table 20, including how they have been incorporated in the refinement of the Preferred Option. To best address the consultation feedback, it was decided to incorporate some of the features of Option #3 into the Preferred Shortlisted Option, specifically those features which provided further improvements for pedestrians and cyclists.

Table 20. Public Consultation Responses – Refinement of Preferred Option

Key Concerns/Suggestions	Addressed in Refined Preferred Option
Congestion – the chosen junction improvement should minimise traffic congestion and ensure vehicles can continue to move through the junction without delay	It is important that the Preferred Option balances the needs of motorised and non-motorised users as well as the priorities of the different project objectives. The Refined Preferred Option was taken forward as it is considered to balance these needs. In terms of addressing forecast capacity constraints at the junction, modelling of the Refined Preferred Option demonstrates that it does increase capacity for motorised traffic compared to the Do Minimum scenario, to a similar level of magnitude as the modelled Options #1 and #2. It also reduces delay and increases amenity for pedestrians and cyclists. More information on the performance of the Refined Preferred Option is provided in the Vissim Forecast Technical Note (AECOM, 2021).
CYCLOPS junction – stakeholders requested further refinement of the CYCLOPS junction (Option #3) to include two-way cycle crossings at the Banbury Road junction in line with best practice in other European countries, such as the Netherlands	Two-way segregated cycle crossings have been taken forward in the development of the Refined Preferred Option. The Refined Preferred Option design provides direct, signal controlled crossings at the western and southern arms for pedestrians and cyclists. It incorporates two-way crossings for cyclists and allows cyclists to cross both arms in one signal stage. The western and southern crossings facilitate the main pedestrian and cyclist movements: the north-to-south and east-to-west movements. It also connects the off-street shared use paths with the carriageway, thereby enabling cyclists to travel on and off the carriageway. In this way, the Refined Preferred Option design ensures that pedestrians and cyclists can efficiently cross the junction at the main desire lines. The provision of facilities close to the junction on the northern/ eastern arms of the junction was found to have limited benefit, due to the surrounding infrastructure and predominant desire lines, so the crossings are considered well-placed away from the junction. In addition, the provision of crossings at the northern/ eastern arms requires an all-red traffic stage, which is the key cause of the extensive congestion predicted by the modelling of the CYCLOPS option (Option #3).
Access for local residents and bus services – stakeholders highlighted the need to ensure that access to and from the A4095 is maintained for local residents and bus services, such as to residential streets to the south of the A4095 and Fringford Road	Modelling of the Refined Preferred Option demonstrates that levels of queueing decrease compared to the Do Minimum scenario, thereby improving access to and from nearby junctions. The signalisation of the junction allows for the impacts on adjacent junctions to be avoided/ managed. More information on the performance of the Preferred Refined Option is provided in the Vissim Forecast Technical Note (AECOM, 2021).
Segregated provision for pedestrians and cyclists – stakeholders emphasised the potential risks of shared use paths, especially for pedestrians and people with disabilities	The Refined Preferred Option provides segregated crossings for pedestrians and cyclists on the routes where the highest number of active mode users are forecast, specifically on the western and southern arms at Banbury Road junction. In this design, a separate cycle track is provided to the west of the B4100 between the junction and the crossing to the north, and to the south of the A4095 between the junction and the crossing to the east.

Key Concerns/Suggestions	Addressed in Refined Preferred Option
	The additional segregated facilities are proposed to reduce conflict between pedestrians and cyclists at the junction. Given that lower volumes of pedestrians and cyclists are forecast on routes using the facilities to the north of the A4095 and east of the B4100, the existing shared use path is considered appropriate. However, the Scheme incorporates a widening of the shared use path to the northeast of the junction, to provide more space for pedestrians and cyclists.
Cycle priority at minor road crossings – stakeholders requested that priority be provided to cyclists at minor road crossings, such as Fringford Road	Cycle and pedestrian priority has been provided at Fringford Road in the Refined Preferred Option. Other minor road crossings in the area do not fall within the scope of this Scheme but can be considered by Oxfordshire County Council in the future.
Safe transitions from the highway onto the cycle path – stakeholders asked for the provision of safe transitions between the carriageway and the cycle paths	The Refined Preferred Option incorporates provision for cyclists to leave and join the carriageway.
Further enhancement of the bridleway – stakeholders requested that the access to the bridleway to the northeast of the junction be improved	The Scheme can accommodate an improved connection between the shared use path along the eastern side of the B4100 and the bridleway. Further consideration will be given to this in the next design stages.

5.5.77 The Preferred Shortlisted Option was refined to incorporate additional improvements for pedestrians and cyclists. The Refined Preferred Option is shown in Figure 39 and Figure 40. The following changes were made to the Preferred Option design in the refinement process:

- Separate two-way cycle crossings are provided for the western and southern arms at the Banbury Road junction;
- Cyclists are more likely to cross the western and southern arms in one signal stage, due to it being a dedicated cycle crossing with less delay caused by interactions with pedestrians;
- A segregated cycle path is provided on the southern side of the A4095, between the eastern arm crossing and the Banbury Road junction, and the western side of the B4100, between Banbury Road junction and the northern arm crossing;
- Provision is provided for cyclists to leave and join the carriageway and to access the off-road provision;
- The pedestrian and cycle crossing over Fringford Road is improved, with priority given to active mode users; and
- The right turn out of Fringford Road has been maintained, with a yellow box provided at the A4095 / Fringford Road junction to facilitate the right turn out for buses.

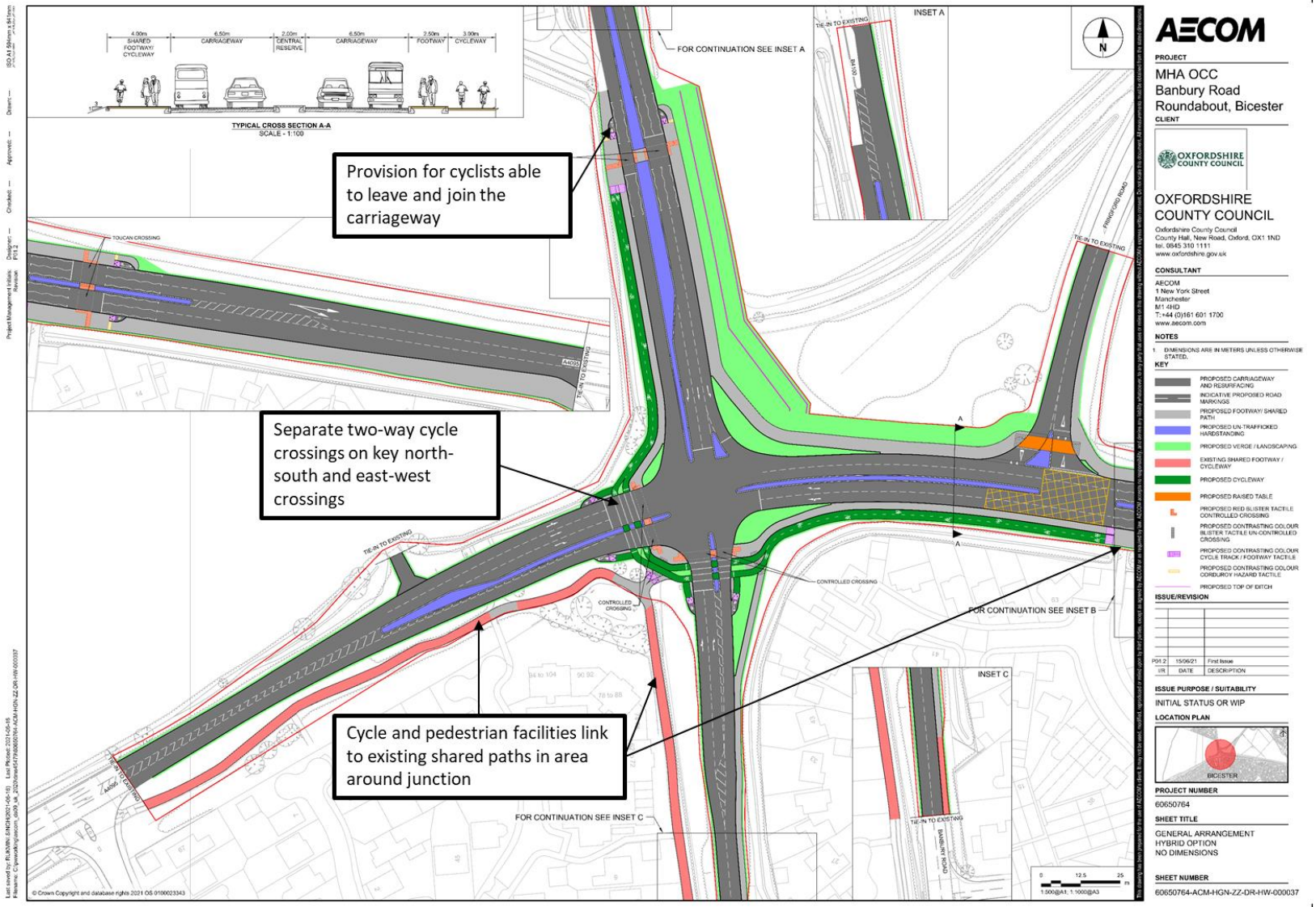

Figure 39. Refined Preferred Option Drawing

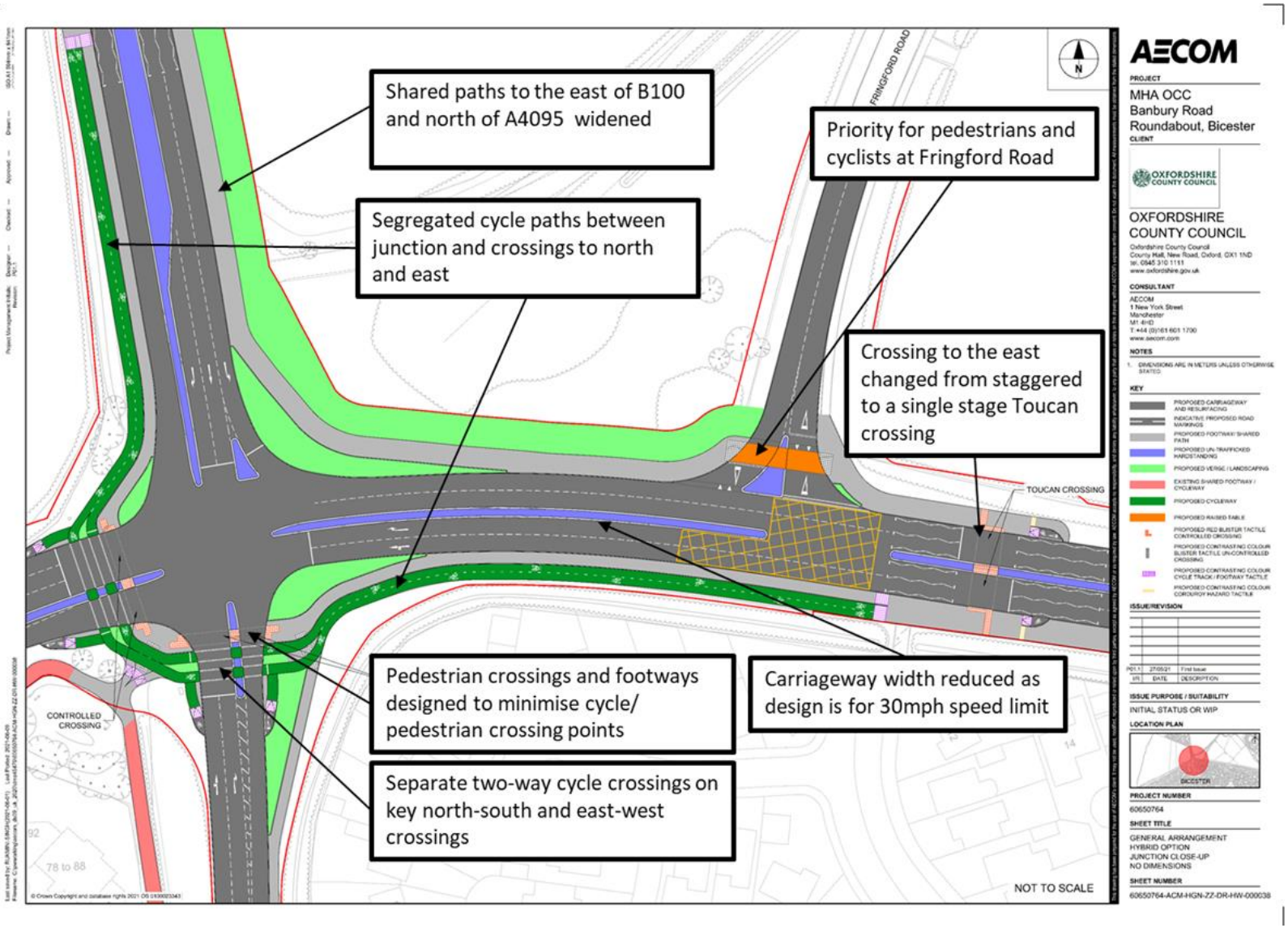

Figure 40. Refined Preferred Option Drawing – Junction

5.5.78 Analysis of pedestrian and cyclist demand and movement patterns identified the main desire lines to be the north-south and the east-west movements, which are served by the western and southern arm crossings. The improvements incorporated into the Refined Preferred Option ensure that pedestrians and cyclists can more efficiently cross the Banbury Road junction at the main desire lines. The Refined Preferred Option design provides direct, signal controlled crossings at the western and southern arms for pedestrians and cyclists. It incorporates two-way crossings for cyclists and allows cyclists to cross both arms in one signal stage. It also connects the off-street shared use paths with the carriageway, thereby enabling cyclists to travel on and off the carriageway. To reduce conflict points between pedestrians and cyclists at the Banbury Road junction, the Refined Preferred Option design provides segregated crossings for pedestrians and cyclists at the junction, in addition to a separate cycle path on the southern side of the A4095 and the western side of the B4100 leading up to the junction.

5.5.79 Modelling of the Refined Preferred Option demonstrates that it increases capacity for motorised traffic compared to the Do Minimum scenario, to a similar level of magnitude as the modelled Shortlisted Options #1 and #2. It also reduces delay for pedestrians and cyclists, in line with Option #2, although the higher cycle speeds possible due to cycle facilities being segregated was not reflected in the modelling, so the improvement may be greater. More information on the performance of the Refined Preferred Option is provided in the Vissim Forecast Technical Note (AECOM, 2021).

5.5.80 The Refined Preferred Option was taken forward for further appraisal.

Sift 2 Assessment of Refined Preferred Option

5.5.81 The Sift 2 appraisal has also been undertaken of the Refined Preferred Option, to retrospectively assess how this option compares against the three Shortlisted options.

5.5.82 This assessment has been undertaken using evidence from the further appraisal of the Refined Preferred Option – Sift 3 – where available, and as such, the level of detailed evidence used in the scoring of the Refined Preferred Option may differ from that used in the scoring of the three Shortlisted options for some of the criteria. Where this is the case, it has been highlighted in the text below.

5.5.83 It should be noted that since the Refined Preferred Option has not gone through public consultation, the management case criteria ‘M2. Stakeholder acceptability’ and ‘M3. Public acceptability/interest’ have not been scored.

5.5.84 Given that the Refined Preferred Option is a refinement of Option #2, it scores in line with Option #2 for most criteria. As a result, the text which follows only presents a detailed discussion of the criteria against which the Refined Preferred Option scores differently than Option #2.

Strategic Case

5.5.85 In scoring the Strategic Case, the same level of detailed evidence was used in scoring the Refined Preferred Option as for the three Shortlisted options.

5.5.86 The Refined Preferred Option scores in line with Option #2 for all the Strategic Case criteria (the project objectives) except for project objective #3 around safety and collision risks. Given the greater levels of segregation between pedestrians and cyclist introduced in the Refined Preferred Option, which reduces the number of conflict points between modes of travel, it received a score of +2.

Economic Case

5.5.87 Excluding one of the environmental sub-criteria, the same level of detailed evidence was also used in scoring the Refined Preferred Option for the Economic Case as for the three Shortlisted options.

5.5.88 For the 'E1. Impact on the economy' sub-criteria, the Refined Preferred Option scores in line with Option #2 for all criteria except for 'E1.1 Business users, freight and transport providers – Construction period traffic impacts'. The Refined Preferred Option provides a more complex design, for example incorporating the bi-directional cycleways and pedestrian crossings. This creates a relatively uncommon layout for the UK which has the potential to disrupt traffic during construction and the construction period being longer.

5.5.89 For the 'E2. Impact on the environment' sub-criteria, the Refined Preferred Option scores in line with Option #2 for all criteria except for 'E2.4 Landscape' and 'E2.5 Streetscape'. The differential landscape scoring was as a result of more detailed environmental impacts assessment having been undertaken following the scoring of the three Shortlisted options. For example, an Arboricultural Impacts Assessment Report and Tree Protection Plan have since been produced which identify the vegetation loss associated with the Refined Preferred Option. These assessments demonstrate that there would be minor changes to the site or local landscape character. Therefore, the Refined Preferred Option was given a neutral score for the 'E2.4 Landscape' criteria.

5.5.90 Given that the Refined Preferred Option incorporates additional and segregated provision for pedestrians and cyclists, which is likely to make the junction appear more user friendly to pedestrians and cyclists, this option was given a neutral score for 'E2.5 Streetscape' in comparison to the negative score given for Option #2.

5.5.91 It should be noted that the environmental assessment of the Refined Preferred Option was based on an earlier version of the design which incorporated a restricted right turn out of Fringford Road, which could have led to wider traffic reassignment. However, based on the strategic modelling previously undertaken, the number of vehicles making the right turn is very low, and therefore the potential reassignment is not expected to have a significant impact on the assessment. The Scheme currently facilitates the right turn out of Fringford Road.

5.5.92 Finally, for the 'E3. Impact on society' sub-criteria, the Refined Preferred Option scores in line with Option #2 for all criteria except for 'E3.3 Accidents'. Given the greater levels of segregation between pedestrians and cyclist introduced in the Refined Preferred Option, which reduces the number of conflict points between modes of travel, it received a score of +2.

Financial Case

5.5.93 A high level (order of magnitude) estimate for the Refined Preferred Option has been produced based on the general arrangement drawing detailed above, incorporating changes based on the Stage 1 Options Estimate Review meeting with Oxfordshire County Council on the 4th May 2021. The incorporated changes include measures for kerbing, street lighting, drainage and a split of the paved area to identify measure of resurfacing to existing carriageway and new carriage full construction.

5.5.94 The cost estimates and assessment of the Sift 2 appraisal of the Refined Preferred Option were undertaken based on the information available at the time.

5.5.95 Cost estimates informed the scoring of the financial case criteria 'F1.1 Infrastructure capital cost, operating and maintenance cost'. The Refined Preferred Option was valued at £14.9M. The cost estimate was considered to be relatively high and was therefore given a score of -2 for this criterion, in line with the other three Shortlisted options.

5.5.96 Further work is being undertaken to clarify key assumptions and costs, which is expected to result in an overall reduction in capital cost of the Refined Preferred Option.

Management Case

5.5.97 In scoring the Management Case, the same level of detailed evidence was used in scoring the Refined Preferred Option as for the three Shortlisted options.

5.5.98 The Refined Preferred Option scores in line with Option #2 for all criteria except for 'M1.2 Construction effect on the network'. The Refined Preferred Option provides a more complex design, for example incorporating the bi-directional cycleways and pedestrian crossings. This creates a relatively uncommon layout for the UK which has the potential to disrupt traffic during construction and the construction period being longer.

Commercial Case

5.5.99 In scoring the Commercial Case, the same level of detailed evidence was used in scoring the Refined Preferred Option as for the three Shortlisted options.

5.5.100 The Refined Preferred Option scores differently from Option #2 for the following sub-criteria to 'C1.1 Dependency and interface risk in relation to other projects, timescale of delivery, contractual complexity and risks': 'Highways design', 'Design of pedestrian facilities' and 'Design of cycle facilities'. Given that the Refined Preferred Option provides a more complex design, for example through the introduction of bi-directional cycleways and crossings, this option is considered to be more complex to design and deliver, with a slightly higher level of risk compared to Option #2.

5.5.101 At the time of the assessment, the cost of the Refined Preferred Option was thought to be in excess of the available funding and for this reason the Scheme scored -2 for 'C3. Funding and Income'.

5.5.102 Since the assessment was undertaken, OCC have confirmed that initial funding will be provided by provided by the Ministry of Housing, Communities and Local Government (MHCLG) and that further funding will be sought from developer contributions and the MHCLG at each stage of the project as it develops.

Updated Sift 2 Results

5.5.103 In Figure 41, total scores for each Business Case element for the Shortlisted options and the Refined Preferred Option are presented. More detailed results for each Business Case element are provided in Figure 42 to Figure 46. Detailed scoring for each sub-criteria is provided in Appendix D.

5.5.104 Figure 41 shows that in terms of overall scores, the Refined Preferred Option is the best performing option. It also performs best for the cases considered most important, specifically the strategic (project objectives) and economic cases. As a result, the Refined Preferred Option is considered to balance the needs of both motorised and non-motorised users, as well as the different priorities across the project objectives.

5.5.105 Given the greater level of construction complexity introduced by the segregated cyclist and pedestrian paths and crossings, the Refined Preferred Option scores

negatively for the management case. The overall negative score for the commercial case was as a result of the uncertainty around available funding at the time, which applies to all the options.

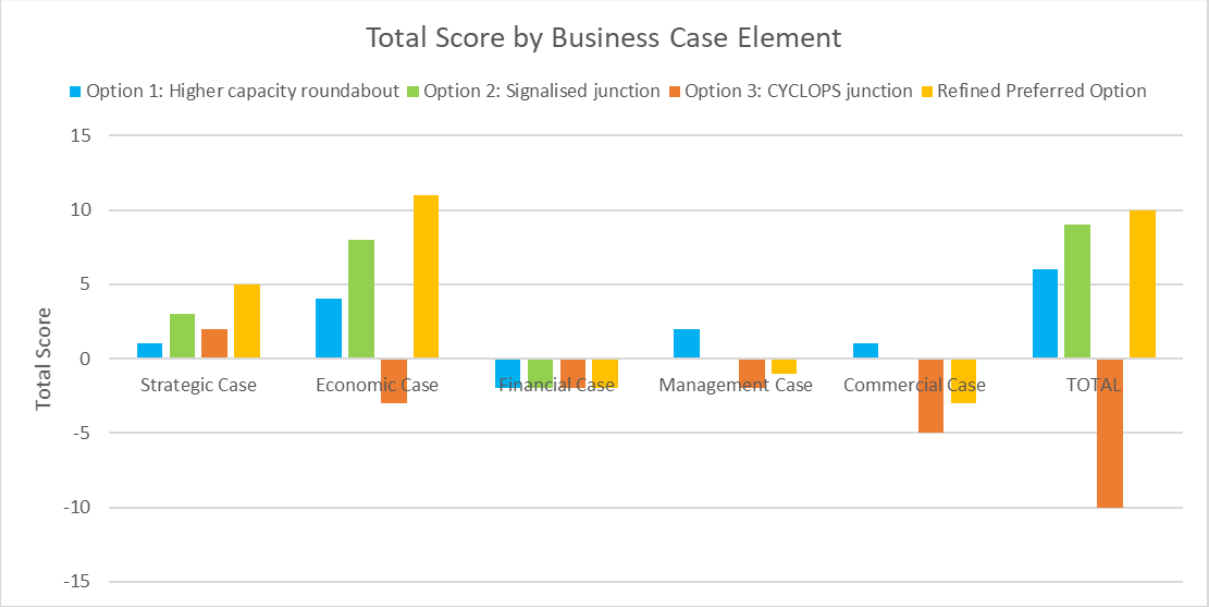

Figure 41. Updated Sift 2 Results – Total Score by Business Case Element

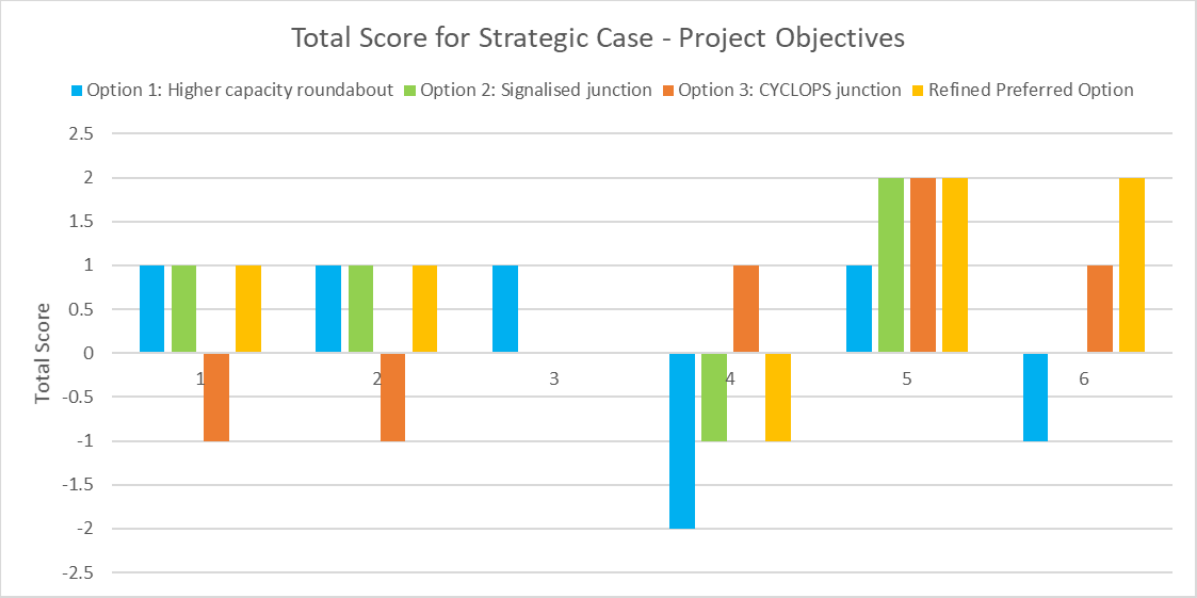

Figure 42. Updated Sift 2 Results – Total Score for Strategic Case

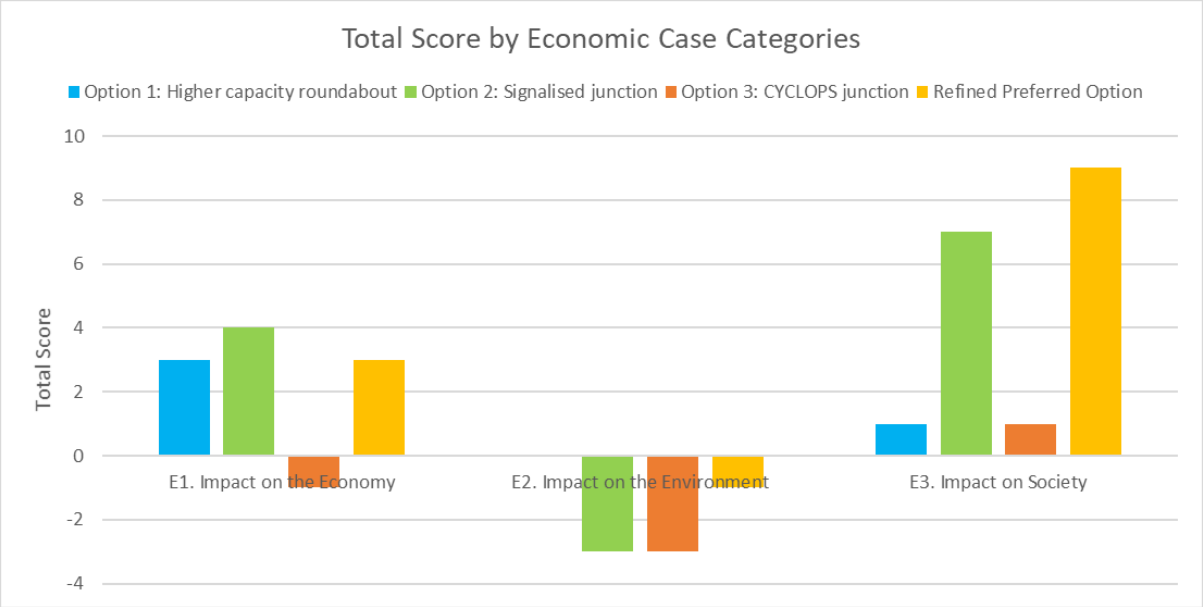

Figure 43. Updated Sift 2 Results – Total Score by Economic Case Categories

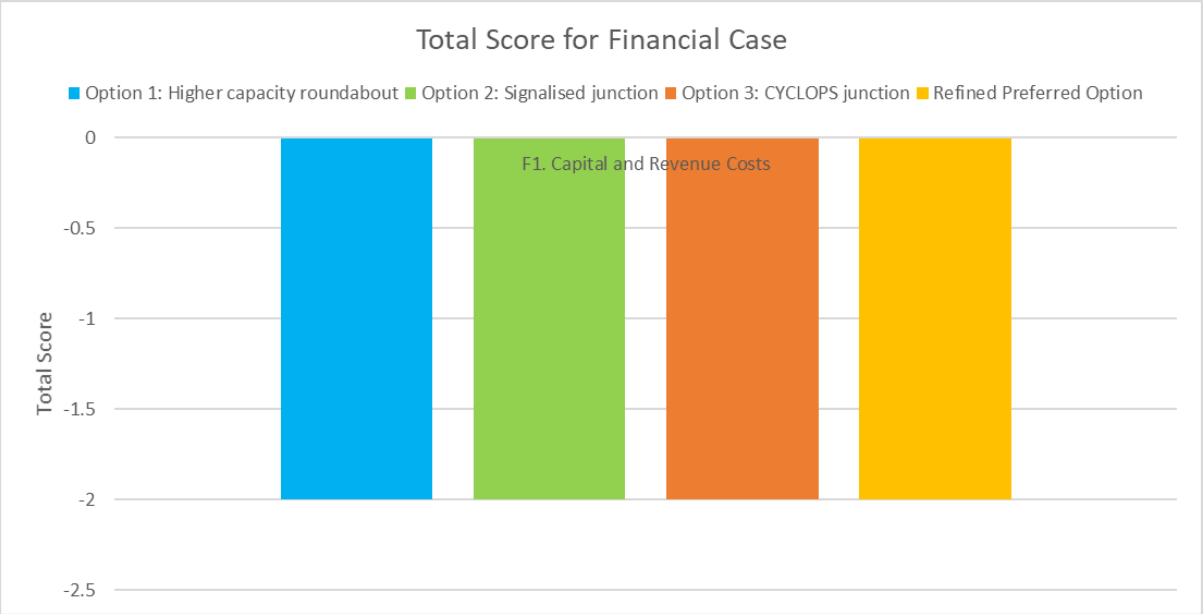

Figure 44. Updated Sift 2 Results – Total Score for Financial Case

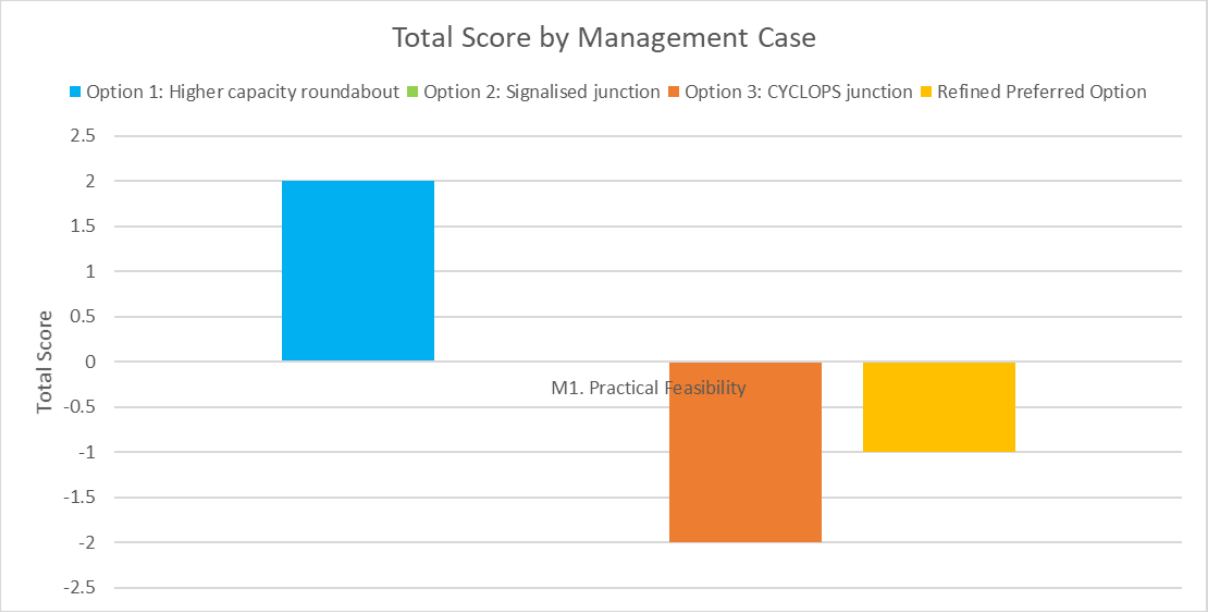

Figure 45. Updated Sift 2 Results – Total Score for Management Case

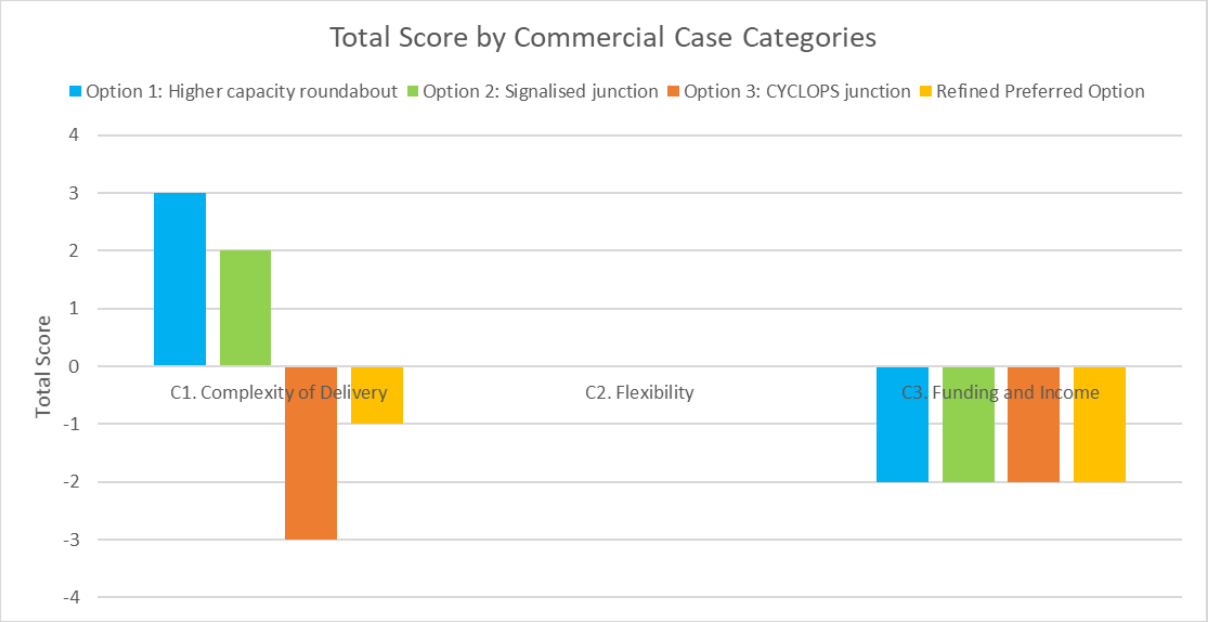

Figure 46. Updated Sift 2 Results – Total Score by Commercial Case Categories

5.6 Sift 3 – Further Appraisal

5.6.1 The third step of the sifting process involved further appraisal of the Refined Preferred Option in line with the methodology set out in the Appraisal Specification Report (ASR), including more detailed modelling and environmental impacts assessment.

5.6.2 Sift 3 consisted of further appraisal of the Refined Preferred Option in line with TAG and covering the sub-impacts of the Appraisal Summary Table, broadly categorised as economy, environmental, social and public accounts impacts.

5.6.3 This section reports on the further appraisal of the Refined Preferred Option in summary form. The appraisal is summarised in the Appraisal Summary Table in Table 22 and discussed further below. Table 22 also identifies which sub-impacts were not assessed in Sift 3 and provides brief justification as to why; more detailed information is provided in the ASR (AECOM, 2021).

Economy Appraisal

5.6.4 The economy sub-impacts of 'business users & transport providers', 'reliability impact on business users' and 'regeneration' were assessed as part of Sift 3.

5.6.5 As discussed in Table 22, the proposed Scheme is expected to have beneficial effects on the economy sub-impacts, specifically as a result of the journey time savings and reductions in average delay per vehicle brought about by the Scheme. Beneficial reliability impacts are expected given that signalisation provides greater adaptability to future changes in traffic flow patterns.

5.6.6 More information on the modelled performance of the Scheme is provided in the Vissim Forecast Technical Note (AECOM, 2021).

Environmental Appraisal

5.6.7 All of the environmental sub-impacts were assessed as part of Sift 3, although it should be noted that given the urban fringe nature of the site, the 'townscape' sub-impact was included in 'landscape'.

5.6.8 Table 21 summarises the outcome of the appraisal of the environmental sub-impacts, with more detail provided in Table 22.

5.6.9 As highlighted in Table 21, the expected impacts on 'noise', 'air quality', 'landscape', 'biodiversity' and 'water environment' range from slight adverse (or an overall net disbenefit) to an overall net benefit. However, the Scheme's effects on these sub-impacts are not considered to be significant. Where necessary, mitigation measures will be proposed.

5.6.10 Both the 'greenhouse gases' and 'heritage of historic resources' sub-impacts are expected to be adversely affected by the Scheme. While the appraisal of the 'greenhouse gases' impact does not consider the significance of the effects, the expected moderate adverse impact on 'heritage of historic resources' is considered to be significant. This is the only environmental sub-impact for which the Scheme is expected to have a significant effect. In consultation with the County Archaeologist, relevant mitigation measures will be identified and used to mitigate the impacts on heritage of historic resources.

5.6.11 The completed TAG worksheets for each environmental sub-impact are provided in Appendix G.

5.6.12 More detailed information on the environmental impacts assessments undertaken for the Scheme is provided in the Air Quality Report, Arboricultural Impact Assessment Report, Tree Protection Plan and Noise Assessment (AECOM, 2021).

Table 21. Sift 3 Results – Summary of Environmental Appraisal

Sub-impact	Effect	Significant?
Noise	Net benefit – an overall decrease in noise as a result of the Scheme.	No
Air quality	Net disbenefit – but the forecast changes in air quality are not considered significant.	No
Greenhouse gases	Adverse – an overall increase in carbon emissions	Not applicable
Landscape	Temporary, short-term impacts of construction plant and activity. Overall, the long-term residual effects on landscape character would be negligible.	No
Heritage of historic resources	Moderate adverse – potential for previously unrecorded archaeology to be physically impacted during construction and potential for two listed buildings to have their setting changed.	Yes
Biodiversity	Slight adverse potential impact on woodland habitats, however this effect is not considered significant. No important ecological features are present within the Scheme.	No
Water environment	Neutral	No

Social and Distributional Appraisal

5.6.13 The social sub-impacts of 'commuting and other users', 'reliability impact on commuting and other users', 'physical activity', 'accidents' and 'severance' were assessed as part of Sift 3.

5.6.14 As discussed in Table 22, the proposed Scheme is expected to have beneficial effects on the social sub-impacts. Given that the Scheme results in lower levels of delay compared to the Do Minimum scenario, and that signalisation provides greater adaptability to future changes in traffic flow patterns, beneficial effects are expected for the sub-impacts of 'commuting and other users' and 'reliability impact on commuting and other users'.

5.6.15 The sub-impacts of 'physical activity', 'accidents' and 'severance' are expected to be beneficially impacted by the Scheme given improvements to pedestrian and cyclist facilities and the resulting reduction in active mode travel times and risk of accidents.

5.6.16 The completed TAG worksheets for the social sub-impacts are provided in Appendix G.

5.6.17 A distributional impacts assessment has been undertaken of the Scheme, considering the variance of Scheme's impacts across different social groups. The first step of the assessment – the screening process – identified two impacts to take forward to the assessment and appraisal of distributional impacts: noise and air quality. Further information on the outcome of the screening process is provided in the ASR (AECOM, 2021).

5.6.18 To understand the income distribution in the noise and air quality impact areas, the Income Deprivation domain of the English Indices of Deprivation (2019) were used. The four Lower Level Super Output Areas (LSOAs) captured by the respective impact areas are among the least deprived areas nationally (80-100% percentiles).

5.6.19 In addition to income distribution, the noise distributional impacts assessment also considers the social groups of 'children and young people' (people under the age of 16) and 'older people' (people over 70 years of age). Looking at the distribution of these social groups in the impact area, it was found that the proportion of children and young

people is in line with the average for England (21% versus 19% for England). However, the average proportion of older people is significantly lower (6% versus 14% for England). While the analysis identified playgrounds and a school in or near the impact area, there were no care homes or hospitals nearby.

5.6.20 The air quality assessment also considers the impact on children and young people, for which the above findings held true.

5.6.21 Given the above findings in terms of the distribution of income groups, children and young people, and older people, and the fact that the noise and air quality assessments showed that the Scheme is not expected to bring about any significant noise or air quality effects (see Table 22), the distributional impacts assessment concluded that the Scheme is expected to have overall neutral distributional impacts in terms of noise and air quality.

5.6.22 It should be noted that the distributional impacts assessment has been based on currently available information regarding the social groups within the vicinity of the Scheme. It would not have been appropriate to make assumptions about the sociodemographic make-up of the current and future transport users given the limited information available through the Vissim modelling, nor would it have been appropriate to make assumptions about the sociodemographic make-up of the future residents of North West Bicester and or any other new development in the impact area.

5.6.23 The completed TAG worksheets for the distributional impacts assessment are provided in Appendix G.

Public Accounts Appraisal

5.6.24 A cost estimate of the Refined Preferred Option was undertaken in line with the approach set out in the ASR and in paragraphs 5.5.93 to 5.5.96 of this report.

5.6.25 The Refined Preferred Option is valued at £14.9M. However, it should be noted that the cost estimate has been undertaken based on the currently available information and is subject to revision. Further work is being undertaken to clarify key assumptions and costs, which is expected to result in an overall reduction in capital cost of the Scheme.

5.6.26 Initial funding for the Scheme is being provided by the Ministry of Housing, Communities and Local Government (MHCLG) to progress the design through planning and preliminary design. Further funding to support the development and delivery of the Scheme will be sought from developer contributions and from the MHCLG. Further funding from the MHCLG will be sought at each stage of the project as it develops so as to reflect refined scheme costs and any potential contributions secured. As such the Public Accounts TAG worksheets have not been completed at this stage as the funding and scheme costings will be refined further at later stages.

Summary

5.6.27 The further appraisal has demonstrated that the proposed Scheme is expected to bring significant benefits across the sub-impacts appraised as part of Sift 3.

5.6.28 The expected benefits are likely to support the delivery of the project objectives. The travel time savings and delay reductions brought about by the Scheme demonstrate that the Scheme is likely to provide a resilient solution to the forecast capacity issues at the A4095 / B4100 Banbury Road junction which, in turn, may support the delivery of homes and jobs across Bicester and at North West Bicester.

5.6.29 The improvements to pedestrian and cyclist facilities introduced as part of the Scheme will allow active mode users to more safely and efficiently cross the junction at the main desire lines, thereby reducing the dangers associated with travel and encouraging more sustainable forms of travel.

5.6.30 The environmental impacts assessment demonstrated that for the majority of sub-impacts, the Scheme is considered to not have a significant effect, including for carbon emissions. As a result, the Scheme is considered to mitigate the impact of vehicular traffic on the local community and urban environment. However, the Scheme is expected to have a significant and adverse effect on heritage of historic resources. To mitigate the impacts on heritage of historic resources, relevant mitigation measures will be identified and used in consultation with the County Archaeologist.

Table 22. Appraisal Summary Table

Sub-impacts		Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
Economy	Business users & transport providers	Average delay per vehicle in the modelled network decreases for motorised vehicles compared to the Do Minimum scenario. This leads to improved travel times through the network. In addition to the delay improvements, the Preferred Option also provides more balanced delay across the approach arms compared to the Do Minimum scenario. The improvements to business users and transport providers are considered to be moderate beneficial.	The Preferred Option sees a 10% decrease in average delay per vehicle in the AM peak and a 51% reduction in the PM peak compared to the Do Minimum scenario.	Moderate beneficial	Not applicable
	Reliability impact on Business users	Signalisation provides greater adaptability to changes in future flow patterns, allowing for balancing of delay across the approaching arms. This is expected to result in slight beneficial improvements in journey time reliability.	Not applicable	Slight beneficial	Not applicable
	Regeneration	Travel times through the network improve to a moderate beneficial degree for motorised vehicles compared to the Do Minimum scenario. The Preferred Option also provides lower levels of localised queueing which improves access to and from nearby junctions. This is likely to help	Not applicable	Moderate beneficial	Not applicable

	Sub-impacts	Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
		support growth across the town and at North West Bicester.			
	Wider impacts	Not assessed as wider impacts considered to be neutral.	Not applicable	Not applicable	Not applicable
Environmental	Noise	There are expected to be minor reductions in operational traffic noise for residential properties immediately south of the A4095 from the speed limit reduction on the A4095. Increases in traffic noise in the future appraisal year are from the North West Bicester development and not as a result of the Preferred Option in isolation. The quantitative monetised value for the scheme represents a net benefit (i.e. reduction in noise).	£166,853.	Not applicable	Neutral The income distribution in the impact area has been derived based on the Income Deprivation domain of the English Indices of Deprivation 2019, which indicates that the four Lower Super Output Areas (LSOAs) captured by the noise impact area are all among the least deprived areas nationally (80-100% percentiles). The Scheme is not considered to bring about significant changes in noise in the impact area. This is also true for changes in noise at the playgrounds and schools in or near the impact area. There are no care homes or hospitals in or near the impact area. The average proportion of children (people < 16 years of age) across the four LSOAs in the noise impact area is in line with the average for England. However, the average proportion of older people (people > 70 years of age) is significantly lower. Therefore, the noise impact on the social groups of Children & young

Sub-impacts	Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
				people and older people is considered neutral.
Air Quality	The Scheme is not located in an Air Quality Management Area (AQMA) and monitored concentrations of NO_2 are well below the relevant objective values close to the junction. The local air quality assessment predicted that the air quality objective values for NO_2 or particulates will not be exceeded in the opening year 2022 with or without the Scheme. The plan level assessment predicted a deterioration in concentrations due to the Scheme.	The local assessment showed that annual mean NO_2 concentrations were predicted to be below the objective value at all selected public exposure receptors. There were some positive and negative impacts at receptors, but effects were considered to be not significant. The ecological assessment concluded that there were no significant air quality effects due to nitrogen deposition or nitrogen oxides based DMRB LA105 guidance. The compliance risk assessment indicated that there are no exceedances of the EU Limit Value so there is no risk to the reported date of compliance with the Air Quality Directive. The Plan Level calculations showed that in the opening year: For $PM_{2.5}$, concentrations would improve at 1,027 properties, stay the same at 197 properties and worsen at 317 properties. For NO_2, concentrations would improve at 576 properties, stay the same at 6 properties and worsen at 959 properties. Net Total Assessment score for $PM_{2.5}$: 6.2	Adverse	Neutral The income distribution in the impact area has been derived based on the Income Deprivation domain of the English Indices of Deprivation 2019, which indicates that the four LSOAs captured by the noise impact area are all among the least deprived areas nationally (80-100% percentiles). The Scheme is not considered to bring about significant changes in air quality in the impact area. This is also true for changes in air quality at the playgrounds in the impact area. There are no schools or hospitals in the impact area. The average proportion of children (people < 16 years of age) across the four LSOAs in the air quality impact area is in line with the average for England. Therefore, the air quality impact on the social group of Children and young people is considered to be neutral.

Sub-impacts	Summary of key impacts	Assessment		
		Quantitative	Qualitative	Distributional
		Net Total Assessment score for NO_2: 107.2. Total value of change in air quality: -£97,167.		
Greenhouse gases	An overall increase in carbon emissions is predicted due to increases in traffic flows and increased congestion with the Scheme in place compared to without the Scheme.	Over the 60-year appraisal period, there was a predicted increase of 3,957 tonnes of carbon with the Scheme in place and a change in non-traded carbon (CO_2e) of -£168,687. There are no traded carbon emissions. There is a predicted opening year increase of 283 tonnes of carbon with the Scheme in place.	Adverse	Not applicable
Landscape	Temporary, short-term impacts of construction plant and activity. Localised and small-scale removal of vegetation within the existing highway corridor. Introduction of a widened road corridor, additional signage and signalised structures within the highway boundary.	Not applicable	Overall, the long-term residual effects on landscape character, both at the Site level and across the Landscape Type and Landscape Character Area would be negligible. From two of the representative viewpoint locations there would be minor adverse residual visual effects as a result of the localised removal of vegetation and negligible effects from all others.	Not applicable
Townscape	Townscape has been assessed as part of the landscape sub-impact given the urban fringe nature of the site.	Not applicable	Not applicable	Not applicable
Heritage of Historic resources	There is potential for previously unrecorded archaeology to be physically impacted during the construction of the Scheme in	Not applicable	Moderate Adverse	Not applicable

Sub-impacts	Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
	areas of agricultural land around the current road. There is also potential for the listed Home Farmhouse and the Church of St Laurence to have their setting changed by an increase in noise and traffic.			
Biodiversity	No important ecological features are present within the Scheme. The biodiversity assessment has identified a potential adverse impact on woodland habitats present within Bure Park Local Nature Reserve and 40m of the A4095 from Nitrogen deposition associated with changes in traffic flows resulting from the operation of the Scheme. This effect is not significant.	Not applicable	Slight Adverse	Not applicable
Water Environment	Baseline information has been obtained from a site walkover (5/3/21) review of publicly available information and from a request for data from the Environment Agency. No direct works are required to any watercourse, but the impermeable area of road will increase by approximately 50% against the existing roundabout. As such, there is potential for additional surface water runoff and accidental spillages containing pollutants to be runoff into receiving watercourses. The drainage strategy is under development but	Not applicable	Neutral	Not applicable

Sub-impacts	Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
	is intended to tie in with the existing site drainage, discharging to Town Brook to the west of the Scheme, and a tributary of Langford Brook to the east of the Scheme. Sustainable Drainage Systems (SuDS) will be provided for water quality treatment prior to discharging to a watercourse, and to attenuate flows to a discharge rate of 40% lower than the existing situation, as per the requirements of Oxfordshire County Council's Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire. As such, there will be no deterioration in water quality in any waterbody and controlled runoff rates will prevent any increase in flood risk downstream. Provision of SuDS where there currently is none will provide a degree of treatment for deicant salts, and potentially an improvement to the receiving watercourses overall in terms of water quality. An assessment of routine road runoff and chemical spillage risk will be undertaken of the final drainage strategy in accordance with the approach outlined in DMRB LA113 Road Drainage and the Water Environment (i.e. a HEWRAT assessment). Should the need for additional mitigation be identified			

	Sub-impacts	Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
		through this exercise, this will be built into the detailed Scheme design. The Scheme will be constructed at grade and all runoff will be to surface watercourses, and as such, no adverse impacts on groundwater quality or flow have been identified. As there are no direct works to watercourses there will be no morphological impacts. A Flood Risk Assessment has been undertaken for the proposed design and indicates no significant increase in flood risk on or off site.			
Social	Commuting and Other users	Average delay per vehicle in the modelled network decreases for motorised vehicles compared to the Do Minimum scenario. This leads to improved travel times through the network. In addition to the delay improvements, the Preferred Option also provides more balanced delay across the approach arms compared to the Do Minimum scenario. The improvements to commuting and other users are considered to be moderate beneficial.	The Preferred Option sees a 10% decrease in average delay per vehicle in the AM peak and a 51% reduction in the PM peak compared to the Do Minimum scenario.	Moderate beneficial	Not applicable
	Reliability impact on Commuting and Other users	Signalisation provides greater adaptability to changes in future flow patterns, allowing for balancing of delay across the approaching arms. This is expected to result in slight	Not applicable	Slight beneficial	Not applicable

Sub-impacts	Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
	beneficial improvements in journey time reliability.			
Physical activity	While the travel time savings forecast for pedestrians and cyclists in the PM peak could be considered large beneficial, there is uncertainty around the delays experienced by pedestrians and cyclists in the Do Minimum scenario, due to the operation of the uncontrolled crossing at the southern approach arm. To account for this uncertainty, a conservative assessment would be that the physical activity impacts are considered to be moderate beneficial. It should be noted that the potential to induce active mode trips as a result of the Scheme has not been assessed; the same level of forecast pedestrian and cyclist demand is forecast for both the with- and without-Scheme scenarios.	Not applicable	Moderate beneficial	Not applicable
Journey quality	Not assessed as journey quality impacts are expected to be limited. Assumed neutral.	Not applicable	Not applicable	Not applicable
Accidents	Higher level of control at crossings compared with Do Minimum scenario. The Refined Preferred Option has more mitigation for conflict points between modes of travel and may lead to a lower propensity for incidents.	Not applicable	Moderate beneficial	Not applicable

Sub-impacts	Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
	Higher degree of segregation of cyclist and pedestrian modes of travel. However, the Refined Preferred Option presents a non-conventional signalised crossroads layout which would be unfamiliar to all users, which could increase propensity for incidents. This is expected to result in moderate beneficial improvements in terms of risk of accidents.			
Security	Not assessed are impacts on security are expected to be limited. Assumed neutral.	Not applicable	Not applicable	Not applicable
Access to services	Not assessed as current levels of access are likely to be maintained. Assumed neutral.	Not applicable	Not applicable	Not applicable
Affordability	Not assessed as impacts on affordability are expected to be limited. Assumed neutral.	Not applicable	Not applicable	Not applicable
Severance	While the severance impacts are considered to be slight positive in two locations and neutral in the remaining two, the total number of people potentially affected by the slight positive impacts are considered to be high (above 6,000 people within a 10 minutes walking radius of the junction). As a result, the overall severance impacts are expected to be slight positive.	Not applicable	Slight positive	Not applicable

Sub-impacts		Summary of key impacts	Assessment Quantitative	Qualitative	Distributional
	Option and non-use values	Not assessed as non-use values are expected to be limited. Assumed neutral.	Not applicable	Not applicable	Not applicable
Public Accounts	Cost to Broad Transport Budget	Not assessed as the scheme costings will be refined at later stages of the design.	Not applicable	Not applicable	Not applicable
	Indirect Tax Revenues	Not assessed as the scheme costings will be refined at later stages of the design.	Not applicable	Not applicable	Not applicable

6 Conclusion

6.1.1 This report has presented the current and future conditions analysis and policy context which underlined the development of project objectives and option generation for the A4095 / B4100 Banbury Road Roundabout Improvements (BRRI) Scheme.

6.1.2 Additionally, this report has set out the approach for the initial longlisting and subsequent sifting stages – sift 1, sift 2 and sift 3 – which resulted in one option being identified as the Refined Preferred Option.

6.1.3 Sift 3 consisted of further appraisal of the Refined Preferred Option in line with the approach set out in the Appraisal Specification Report (ASR). This appraisal demonstrated that the proposed Scheme is expected to bring about significant benefits which will contribute to delivering the project objectives.

6.1.4 As a document which sets out how the Refined Preferred Option has been determined it is a key document which will support the Scheme's planning application.

Appendix A **Sift 2 Criteria**

Table 23. Sift 2 – Strategic Case Criteria

Category	Criteria	Sub-criteria
S1. Project Objectives	S1.1 Project Objectives* *National and local policies incorporated in the scoring of the Project Objectives	Support the growth of new homes and jobs, and increase economic vitality
		Provide a resilient solution which addresses the forecast levels of congestion at the A4095 / B4100 Banbury Road Roundabout
		Mitigate the impact of vehicular traffic issues at the A4095 / B4100 Banbury Road roundabout on communities and the urban environment
		Reduce carbon emissions from transport in the town
		Encourage alternative forms to car use where suitable including public transport, active travel and smarter choices
		Reduce casualties and dangers associated with travel

Table 24. Sift 2 – Economic Case Criteria

Category	Criteria	Sub-criteria
E1. Impact on the Economy	E1.1 Business users, freight, and transport providers	Highway user travel time changes, excluding bus users
		Bus travel time changes
		Walk travel time changes
		Cycle travel time changes
		Construction period traffic impacts
		Construction impacts - walk and cycle
	E1.2 Reliability	Variability in highway user journey times
E2. Impact on the Environment	E2.1 Noise	Construction period environmental impacts
		Operation period environmental impacts
	E2.2 Air quality	Estimated change in NOx/PM emitted
	E2.3 Greenhouse gases	Change in CO2/Carbon emissions
	E2.4 Landscape	Impact on landscape, including visual impact, such as on the hedgerow
	E2.5 Streetscape	Impact on streetscape and urban environment
	E2.6 Historic environment	Impact on historic landfill, listed buildings and scheduled monuments
	E2.7 Biodiversity	Impact on biodiversity
	E2.8 Water environment	Flood mitigation
		Water quality
E3. Impact on Society	E3.1 Non-business users, including commuters and leisure/education	Highway user travel time changes
		Bus travel time changes
		Walk travel time changes
		Cycle travel time changes
	E3.2 Physical activity	Health benefits
	E3.3 Accidents	Impact on rate of incidents
	E3.4 Severance	Severance
	E3.5 Accessibility – access to the road/infrastructure for residents/land owners	E.g. access implications in terms of queues blocking back and prohibiting access to side roads

Table 25. Sift 2 – Financial Case Criteria

Category	Criteria	Sub-criteria
F1. Capital and Revenue Costs	F1.1 Infrastructure capital costs, operating and maintenance costs	Estimate of capital costs

Table 26. Sift 2 – Management Case Criteria

Category	Criteria	Sub-criteria
M1. Practical Feasibility	M1.1 Engineering, interfaces, complexity and feasibility	Design and construction - including programme, design standards, etc
	M1.2 Construction effect on the network	Impact of construction on the network, e.g. traffic management and delays
	M1.3 Possibility to change option – option flexibility	Future proofing
M2. Stakeholder Acceptability	M2.1 Stakeholder acceptability/interest	Views expressed by stakeholders during the consultation process
M3. Public Acceptability/Interest	M3.1 Public acceptability/interest	Public view on scheme components, including public consultation responses

Table 27. Sift 2 – Commercial Case Criteria

Category	Criteria	Sub-criteria
C1. Complexity of Delivery	C1.1 Dependency and interface risk in relation to other projects, timescale of delivery, contractual complexity and risks	Highways design
		Design of pedestrian facilities
		Design of cycling facilities
		Interface with other schemes considered
C2. Flexibility	C2.1 Possibility to change option – option flexibility	Breaking down of schemes to ease the delivery (specialist partners for example)
C3. Funding and Income	C3.1 Scope to meet funding criteria	MHCLG funding conditions

Appendix B **High-level Sift Results**

#	Long List of Concepts	Sifting Commentary	Project Objectives						Affordability	Technical Complexity	Acceptability	Total	Rank
			1	2	3	4	5	6					
1	Pedestrian and cycle network	Supports the masterplan vision for NW Bicester and Bicester as a whole in terms of facilitating sustainable growth and travel. Unlikely to address forecast congestion issues due to these issues expected to be a result of additional traffic above and beyond the ambitious sustainable travel targets at NW Bicester. Impacts on urban environment and carbon emissions could be limited by low mode shift away from car use. Dedicated infrastructure provision for pedestrians and cyclists likely to reduce perceived dangers and real risks associated with active travel.	1	0	1	1	2	1	2	2	1	11	1
2	Bus service improvements	Supports the masterplan vision for NW Bicester and Bicester as a whole in terms of facilitating sustainable growth and travel. Unlikely to address forecast congestion issues due to these issues expected to be a result of additional traffic above and beyond the ambitious sustainable travel targets at NW Bicester. Impacts on urban environment and carbon emissions could be limited by low mode shift away from car use. Operation and maintenance involves	1	0	1	1	2	1	1	2	1	10	3

#	Long List of Concepts	Sifting Commentary	Project Objectives						Affordability	Technical Complexity	Acceptability	Total	Rank
			1	2	3	4	5	6					
		external partners, such as service providers and may have implications for depot use / capacity needs.											
3	Bus priority network	Supports growth (homes and jobs) and facilitates sustainable travel. Unlikely to address forecast congestion issues due to these issues expected to be a result of additional traffic above and beyond the ambitious sustainable travel targets at NW Bicester. Impacts on urban environment and carbon emissions could be limited by low mode shift away from car use. Scheme could be simple signalling or dedicated bus lane. While in line with sustainable travel policies, likely to involve challenges in terms of public and stakeholder acceptability due to the costs involved.	1	0	1	1	2	1	0	0	0	6	6
4	New rail station	Supports growth at NW Bicester (if the new station were to be located there/in the vicinity), however judged unlikely to have a significant impact on the forecast congestion issues at the roundabout as the forecast traffic is expected to be predominantly internal trips within Bicester, whereas a rail station would predominantly serve external trips. Impacts on urban environment and carbon emissions limited by the expected minimal impact on internal car trips. Capital costs expected to be high and the project relatively complex	2	0	0	1	2	1	-2	-1	-1	2	8

#	Long List of Concepts	Sifting Commentary	Project Objectives						Affordability	Technical Complexity	Acceptability	Total	Rank
			1	2	3	4	5	6					
		(especially when compared to other options). Public acceptability likely to be low due to associated costs and questioning of the need for further rail interventions, given the planned East-West Rail project.											
5	New highway	While new highway infrastructure may support growth and address forecast capacity issues at the roundabout by moving traffic onto the new highway provision, the provision of additional capacity is likely to create induced demand which will negatively impact the urban environment and increase carbon emissions more widely in the town. A new road is considered to be comparatively more complex in terms of length of provision and links into existing network. Stakeholder / public support likely to be low given associated costs as well as local sustainable travel priorities and national and regional climate policies.	2	1	-1	-1	-2	0	-1	0	-2	-4	10
6	Capacity improvements on existing highway	While new improvements may support growth it may not address the forecast capacity issues at the roundabout since these are bound to the junction capacity and not the link (highway) capacity. The provision of additional capacity is likely to create induced demand which will negatively impact the urban environment	1	1	-1	-1	-2	0	0	0	0	-2	9

#	Long List of Concepts	Sifting Commentary	Project Objectives						Affordability	Technical Complexity	Acceptability	Total	Rank
			1	2	3	4	5	6					
		and increase carbon emissions more widely in the town.											
7	Junction capacity improvement	Junction capacity improvement will support growth particularly at NW Bicester and are likely to address forecast capacity issues at the roundabout and may therefore mitigate impacts on communities and the urban environment, e.g. by reducing carbon emissions from queueing at the roundabout. By providing for sustainable modes at the junction, intervention likely to encourage sustainable travel. Locally focused intervention which is could be less complex. Improved junction design in terms of safety.	2	2	2	0	1	1	1	1	1	11	1
8	Travel planning	Unlikely to address forecast congestion issues due to these issues expected to be a result of additional traffic above and beyond the ambitious sustainable travel targets at NW Bicester. Impacts on urban environment and carbon emissions could be limited by low mode shift away from car use. Demand based interventions are generally less costly and more practically feasible than infrastructure or service based interventions.	0	0	1	1	1	0	2	2	1	8	4
9	On-demand sharing scheme	Unlikely to address forecast congestion issues due to these issues expected to be a result of additional traffic above and beyond the ambitious sustainable travel	0	0	1	1	1	0	2	2	1	8	4

#	Long List of Concepts	Sifting Commentary	Project Objectives						Affordability	Technical Complexity	Acceptability	Total	Rank
			1	2	3	4	5	6					
		targets at NW Bicester. Impacts on urban environment and carbon emissions could be limited by low mode shift away from car use. Demand based interventions are generally less costly and more practically feasible than infrastructure or service based interventions.											
10	Demand management through pricing/charging	Unlikely to address forecast congestion issues due to these issues expected to be a result of additional traffic above and beyond the ambitious sustainable travel targets at NW Bicester. Impacts on urban environment and carbon emissions could be limited by low mode shift away from car use. Demand based interventions are generally less costly and more practically feasible than infrastructure or service based interventions. Stakeholder / public support likely to be low as intervention involves economic disincentive.	0	0	1	1	1	0	2	2	-2	5	7

Appendix C **Sift 1 Results**

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
1	Retrofit of existing roundabout	Option unlikely to increase capacity for motorised vehicles due to the difficulty of providing capacity within existing geometry, thereby not addressing forecast congestion issues, which may hinder growth and worsen impact on communities and urban environment. The option provides crossing facilities for active modes, thereby increasing potential for mode shift away from cars, which is likely to lead to a reduction in carbon emissions overall. Roundabouts generally introduce more conflict which increases safety risks. No risk of exceeding budget. Deliverability challenges due to providing crossings close to the roundabout. Option not likely to be seen as acceptable due to not addressing forecast capacity issues.	-1	-1	-1	1	1	-2	-3	2	-1	-1	1	1
2	Dutch style roundabout with pedestrian and cyclist crossings close to the roundabout	Option likely to reduce capacity for motorised vehicles due to priority given to active modes. Less likely to address forecast congestion issues, which could hinder growth and not mitigate the impact of traffic growth on communities and urban environment.	-1	-1	-1	1	2	-1	-1	1	1	0	0	2

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
		The option prioritises active modes over highway traffic, which could significantly increase the potential for mode shift away from cars and reduce carbon emissions. However, there are potential safety risks due to users not being familiar with this type of junction design, though these could reduce over time as people become more familiar. Likely to be delivered within budget. This junction type has been delivered in the UK before, however is not as common as other options. Could be seen as a controversial choice, with strong support from some and objections from others.												
3	Higher capacity roundabout with pedestrian and cyclist crossings away from the roundabout	Capacity improvement for motorised vehicles likely to support growth, address forecast congestion issues and mitigate negative impacts on communities and the urban environment. While active mode crossings are provided, the facilities are not located near the junction (similar to the existing provision), thereby increasing travel distances for pedestrians and cyclists (compared to crossings at /close to the junction). Roundabouts generally introduce more conflict which increases safety risks. Involves standard procedures in terms of deliverability and technical	2	2	1	-1	-1	-1	2	0	1	0	1	2

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
		feasibility. Likely to be accepted by some as it addresses capacity issues, but not accepted by others due to not providing for sustainable modes.												
4	Higher capacity roundabout with pedestrian and cyclist crossing facilities close to the roundabout	Capacity improvement for motorised vehicles likely to support growth, address forecast congestion issues and mitigate negative impacts on communities and the urban environment. Provision of crossing facilities close to the junction may introduce capacity constraints for motorised traffic. Crossing facilities for active modes unlikely to be direct. Safety risks due to the proximity of crossings to the roundabout. Deliverability and technical challenges to providing crossing facilities close to the roundabout.	1	1	1	0	0	-2	1	0	-1	0	0	-1
5	Higher capacity roundabout with A4095 underpasses for pedestrians and cyclists	Capacity improvement for motorised vehicles likely to support growth, address forecast congestion issues and mitigate negative impacts on communities and the urban environment. While the option provides a segregated crossing for active modes, it is unlikely to be popular or widely used by pedestrians and cyclists due to perceived safety issues and the crossing not being provided at desire lines. Capacity improvements likely to induce	2	2	1	-1	-1	-1	2	-1	-1	-1	0	-3

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
		motorised travel, thereby increasing carbon emissions. High costs due to need to introduce structures and the land take required. Increased complexity in terms of deliverability. Underpass may not be considered suitable due to perceived safety risks.												
6	Higher capacity roundabout with pedestrian and cyclist bridge crossings of A4095	Capacity improvement for motorised vehicles likely to support growth, address forecast congestion issues and mitigate negative impacts on communities and the urban environment. While the option provides a segregated crossing for active modes, it is unlikely to be popular or widely used by pedestrians and cyclists due to crossing not being provided at desire lines. Capacity improvements likely to induce motorised travel, thereby increasing carbon emissions. High costs due to need to introduce structures and the land take required, with increased complexity in terms of deliverability. Bridge may not be acceptable due to costs and this type of grade separated crossing being less popular with pedestrians and cyclists.	2	2	1	-1	0	-1	3	-1	-1	-1	0	-3
7	Shared space roundabout	Option likely to reduce capacity for motorised vehicles due to priority given to active modes, thereby not addressing forecast congestion	-1	-1	-1	1	1	-1	-2	1	-2	-2	1	-2

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
		issues, which may hinder growth and worsen impact on communities and urban environment. While the option provides for active modes at desire lines, the junction type may not be suitable for all pedestrians (given the flow of traffic and lack of separation). However, option still likely to increase potential for mode shift away from car, thereby reducing carbon emissions overall. Safety risks due to mixing of modes in a non-low speed environment, both in terms of perceived risk (e.g. for cyclists) and risk of collisions. Likely to be delivered within budget. Significant deliverability issues due to the challenge of turning a formal junction into an informal junction in a high-speed environment. Potentially seen as being less acceptable due to safety risks and this type of junction being less familiar to users.											
8	Turbo roundabout with crossing facilities away from the junction	Capacity improvement for motorised vehicles likely to support growth, address forecast congestion issues and mitigate negative impacts on communities and the urban environment. Active mode crossing are provided away from the junction - similar to the existing provision - thereby increasing travel distances for	2	2	1	-1	-1	0	3	0	0	-1	0	-1

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
		pedestrians and cyclists. The design reduces conflict through the junction which improves safety. Land take required likely to increase costs. Potentially less acceptable due to unfamiliarity with this type of junction.												
9	Signalised roundabout with crossing facilities close to the roundabout	Signalisation allows for greater flexibility in managing flows through the junction thereby increasing capacity and addressing forecast congestion issues. This would potentially support growth and mitigate the forecast impacts on communities and urban environment. Crossing facilities for active modes unlikely to be direct. Signalisation improves safety at crossings. Significant land intake likely to be required to accommodate the roundabout, which negatively impacts on affordability and deliverability. Size of the junction likely to make it unacceptable.	2	2	1	0	0	1	6	-2	-2	-1	0	-5
10	CYCLOPS junction with pedestrian and cyclist crossings close to the junction	Signalisation allows for greater flexibility in managing flows through the junction, thereby increasing capacity, which is likely to support growth, address forecast congestion issues, and mitigate impacts on communities and urban environment. The option prioritises active modes, thereby significantly increasing the	1	1	1	1	2	1	7	0	0	1	0	1

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
		potential for mode shift away from cars, leading to a reduction in carbon emissions overall. However, the junction design includes on-street provision for cyclists, whereas existing network is mainly off-street, thereby requiring integration between junction design and current provision. Separation between modes and signalisation likely to improve safety. Option likely to be deliverable within budget and involve standard procedures in terms technical complexity. Likely to be acceptable due to both providing additional capacity and encouraging sustainable modes.												
11	Signalised junction with bus priority and pedestrian and cyclist crossings close to the junction	Signalisation allows for greater flexibility in managing flows through the junction, thereby increasing capacity, which is likely to support growth, address forecast congestion issues, and mitigate impacts on communities and urban environment. Crossings for active modes are provided for and buses are prioritised through the junction, thereby significantly increasing the potential of mode shift away from cars, thereby reducing overall carbon emission. Signalisation would improve safety. Involves standard procedures in terms	1	1	1	1	2	1	7	0	1	1	1	3

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
		of deliverability and technical feasibility. Option likely to be accepted by stakeholders and the public due to aligning with sustainable travel policy objectives and the crossing facilities linking in with existing off-road network.												
12	Signalised junction with dedicated bus lane and crossing facilities close to the junction	While signalisation allows for greater flexibility in managing flows through the junction, the provision of a dedicated bus lane could potentially limit capacity gains for other motorised users, with implications for growth and congestion. The option prioritises bus use, and provides crossing facilities for active modes which link with the existing network, thereby significantly increasing the potential for mode shift away from cars. This is likely to lead to a reduction in carbon emissions overall. Signalisation generally improves safety. There is a question over demand for such a service, which may mean that it is not deemed to be an acceptable option. Provision of dedicated bus lane likely to considerably increase costs and complexity in terms of deliverability.	0	0	0	1	2	1	4	-1	-1	-1	0	-3
13	At grade Hamburger junction with pedestrian and	Option likely to increase capacity for motorised vehicles, thereby supporting growth, addressing forecast congestion issues and	2	2	1	0	0	1	6	-2	-2	-1	0	-5

#	Long List of Options	Sifting Commentary	Project Objectives							Perceived Feasibility				
			1	2	3	4	5	6	Total	Affordability	Deliverability	Acceptability	Technical Complexity	Total
	cyclist crossings close to the junction	mitigating negative impacts on communities and the urban environment. The additional movements allowed in this type of junction likely to reduce the priority given to crossings, therefore the proximity of crossing facilities is not likely to constrain capacity for motorised vehicles. Crossing facilities for active modes unlikely to be direct. Signalisation generally improves safety. Costs likely to be high. Required land take increases complexity and presents deliverability challenges. While the public may be used to a design like this due to there already being one in Bicester, it might not be seen as a suitable option by stakeholders.												

Appendix D **Sift 2 Results (including Refined Preferred Option)**

Table 28. Sift 2 Results – Strategic Case

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
S1. Project Objectives								
S1.1 Project objectives: Support the growth of new homes and jobs, and increase economic vitality	1	Travel times through the network improve for motorised vehicles compared to the Do Minimum scenario. This is likely to help support growth across the town.	1	Travel times through the network improve for motorised vehicles compared to the Do Minimum scenario. This is likely to help support growth across the town.	-1	Travel times through the network worsen for private motorised vehicles compared to the Do Minimum scenario.	1	Travel times through the network improve for motorised vehicles compared to the Do Minimum scenario. This is likely to help support growth across the town.
S1.1 Project objectives: Provide a resilient solution which addresses the forecast levels of congestion at the A4095 / B4100 Banbury Road roundabout	1	Average delay per vehicle in the network decreases for motorised vehicles compared to the Do Minimum scenario.	1	Average delay per vehicle in the network decreases for motorised vehicles compared to the Do Minimum scenario.	-1	Average delay per vehicle in the network increases for motorised vehicles compared to the Do Minimum scenario.	1	Average delay per vehicle in the network decreases for motorised vehicles compared to the Do Minimum scenario.
S1.1 Project objectives: Mitigate the impact of vehicular traffic issues at the A4095 / B4100 Banbury Road roundabout on communities and	1	The three options are expected to have similar impacts on construction noise levels, whereas Option 1 may see lower levels of noise during operation compared to the other two options. As both Option 1 and Option 2 are expected to increase vehicle	0	The three options are expected to have similar impacts on construction noise levels, whereas Option 1 may see lower levels of noise during operation compared to the other two options. As both Options 1 and 2 are expected to increase vehicle capacity, they are	0	The three options are expected to have similar impacts on construction noise levels, whereas Option 1 may see lower levels of noise during operation compared to the other two options. Option 3 is expected to have negative impacts in terms of air quality due	0	All options are expected to have similar impacts on construction noise levels, whereas Option 1 may see lower levels of noise during operation compared to the other options. As options 1, 2 and the Refined Preferred Option are expected to

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
the urban environment		capacity, they are expected to have neutral or positive impacts in terms of air quality, the difference between the options being that Option 2 has the potential to increase exposure as the carriageway is potentially closer to residential properties at the south of the junction. Option 1 is expected to bring about less loss of hedgerow and trees than Option 3, and is likely to have neutral impact on streetscape.		expected to have neutral or positive impacts in terms of air quality, the difference between the options being that Option 2 has the potential to increase exposure as the carriageway is potentially closer to residential properties at the south of the junction. Option 2 is expected to bring about the same loss of hedgerow and trees as Option 1, however it may have a negative impact in terms of streetscape.		to reducing vehicle capacity and having the potential to increase exposure as the carriageway is potentially closer to residential properties at the south of the junction. Option 3 is expected to bring about the greatest loss of hedgerow and trees, however it may conversely have the most positive impact in terms of streetscape.		increase vehicle capacity they have the potential to reduce congestion and are therefore expected to have neutral or positive impacts in terms of air quality. The differences between the options is that option 2 and the Refined Preferred Option have the potential to increase residents' exposure to noise and air quality issues as the carriageway is closer to residential properties at the south of the junction. The Refined Preferred Option is expected to bring about the least loss of hedgerow and trees, although it should be noted that this option's impact on landscape has been based on more detailed assessment than the other options. The Refined Preferred Option is likely to have a neutral impact on streetscape.
S1.1 Project objectives: Reduce carbon	-2	While crossing facilities for pedestrians and cyclists are somewhat	-1	Crossing facilities for pedestrians and cyclists are significantly	1	Crossing facilities for pedestrians and cyclists are significantly	-1	Crossing facilities for pedestrians and cyclists are significantly

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
emissions from transport in the town		improved compared to existing provision, capacity for motorised vehicles is also improved, which may create induced demand for car travel.		improved compared to existing provision for pedestrians and cyclists, which has the potential to encourage travel by active modes. However, capacity for motorised vehicles is improved compared to the Do Minimum scenario, which may create induced demand for car travel.		improved compared to existing provision for pedestrians and cyclists, which has the potential to encourage travel by active modes. Capacity for motorised vehicles is somewhat reduced compared to the Do Minimum scenario which may discourage travel by car across town.		improved compared to existing provision for pedestrians and cyclists, which has the potential to encourage travel by active modes. However, capacity for motorised vehicles is improved compared to the Do Minimum scenario, which may create induced demand for car travel.
S1.1 Project objectives: Encourage alternative forms to car use where suitable including public transport, active travel and smarter choices	1	Average delay per pedestrian and cyclist decreases compared to the Do Minimum scenario. Crossing facilities are somewhat improved compared to existing provision for pedestrians and cyclists.	2	Average delay per pedestrian and cyclist decreases compared to the Do Minimum scenario. Crossing facilities are significantly improved compared to existing provision for pedestrians and cyclists. Potential for signal priority for buses.	2	Average delay per pedestrian and cyclist decreases compared to the Do Minimum scenario. Crossing facilities are significantly improved compared to existing provision for pedestrians and cyclists. Potential for signal priority for buses.	2	Average delay per pedestrian and cyclist decreases compared to the Do Minimum scenario. Crossing facilities are significantly improved compared to existing provision for pedestrians and cyclists. Potential for signal priority for buses.
S1.1 Project objectives: Reduce casualties and dangers associated with travel	-1	Conventional roundabout layout would be familiar to all users which would reduce propensity for incidents. Uncontrolled crossings do not mitigate for conflict points between modes of travel and may lead to a higher propensity for incidents.	0	Conventional signalised crossroads layout would be familiar to all users which would reduce propensity for incidents. Controlled crossings does mitigate for conflict points between modes of travel and may lead to an average propensity for incidents.	1	Higher level of control at crossings compared with Option 2 has more mitigation for conflict points between modes of travel and may lead to a lower propensity for incidents. Higher degree of segregation of cyclist	2	Higher level of control at crossings compared with Option 2 and Option 3. This option has more mitigation for conflict points between modes of travel and may lead to a lower propensity for incidents. Highest degree of segregation of cyclist

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		No segregation of cyclist and pedestrian modes of travel. Southern arm of junction retains use of uncontrolled crossing facilities with a higher propensity for incidents.		No segregation of cyclist and pedestrian modes of travel.		and pedestrian modes of travel. However, Option 3 presents a non-conventional signalised crossroads layout would be unfamiliar to all users, which could increase propensity for incidents.		and pedestrian modes of travel. However, Refined Preferred Option presents a non-conventional signalised crossroads layout which would be unfamiliar to all users, which could increase propensity for incidents.
Total Strategic Case Score	1		3		2		5	

Table 29. Sift 2 Results – Economic Case

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
E1. Impact on the Economy								
E1.1 Business users, freight, and transport providers: Highway user travel time changes, excluding bus users	1	Travel times through the network improve for private motorised vehicles compared to the Do Minimum scenario.	1	Travel times through the network improve for private motorised vehicles compared to the Do Minimum scenario.	-1	Travel times through the network worsen for private motorised vehicles compared to the Do Minimum scenario.	1	Travel times through the network improve for private motorised vehicles compared to the Do Minimum scenario.
E1.1 Business users, freight, and transport providers: Bus travel time changes	0	Travel times for buses through the network are consistent with those in the Do Minimum scenario.	0	Travel times for buses through the network are consistent with those in the Do Minimum scenario.	-1	Travel times through the network worsen for buses compared to the Do Minimum scenario.	0	Travel times for buses through the network are consistent with those in the Do Minimum scenario.
E1.1 Business users, freight, and transport providers: Walk travel time changes	0	Travel times for pedestrians through the network are consistent	1	Travel times for pedestrians through the network improve	1	Travel times for pedestrians through the network improve	1	Travel times for pedestrians through the network improve

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		with those in the Do Minimum scenario.		compared to the Do Minimum scenario.		compared to the Do Minimum scenario.		compared to the Do Minimum scenario.
E1.1 Business users, freight, and transport providers: Cycle travel time changes	0	Travel times for cyclists through the network are consistent with those in the Do Minimum scenario.	1	Travel times for cyclists through the network improve compared to the Do Minimum scenario.	0	Travel times for cyclists through the network are consistent with those in the Do Minimum scenario.	1	Travel times for cyclists through the network improve compared to the Do Minimum scenario.
E1.1 Business users, freight, and transport providers: Construction period traffic impacts	1	Least complex design out of the three options: - substantial sections of carriageway can be constructed offline from existing carriageway and then used for traffic while other sections of existing carriageway are altered. - Minimal new technology infrastructure required. - larger overall scheme footprint and more new carriageway required than other options.	0	Typical UK type signalised junction, including appropriate amount of technology: - more complex traffic management than Option 1 because there is less additional road space being created to use for temporary traffic management - reduced offline new carriageway with less flexibility for temporary traffic management.	-1	More complex new type of junction relatively uncommon in the UK, including more technology required: - more complex traffic management than Option 1 because there is less additional road space being created to use for temporary traffic management - reduced offline new carriageway with less flexibility for temporary traffic management. - higher complexity and potential to disrupt traffic during construction of more complex paving / surfacing arrangement and additional signs and signal controls. - more complex surface drainage design required to avoid conflicts with pedestrian	-1	More complex new type of junction relatively uncommon in the UK, including more technology required: - more complex traffic management than Option 1 because there is less additional road space being created to use for temporary traffic management - reduced offline new carriageway with less flexibility for temporary traffic management. - higher complexity and potential to disrupt traffic during construction of more complex paving / surfacing arrangement and additional signs and signal controls. - more complex surface drainage design required to avoid conflicts with

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
						and cyclist crossing points.		pedestrian and cyclist crossing points.
E1.1 Business users, freight, and transport providers: Construction impacts - walk and cycle	1	This option will impact on existing pedestrian and cyclist routes and road crossings. Marginal advantage over other options because some new pedestrian and cyclist routes could be constructed offline before significant changes to existing layout take place. It is expected that safe routes for pedestrians and cyclists similar to existing or via appropriate diversion routes will be maintained by the contractor during construction.	0	This option will impact on existing pedestrian and cyclist routes and road crossings. It is expected that safe routes for pedestrians and cyclists similar to existing or via appropriate diversion routes will be maintained by the contractor during construction.	0	This option will impact on existing pedestrian and cyclist routes and road crossings. It is expected that safe routes for pedestrians and cyclists similar to existing or via appropriate diversion routes will be maintained by the contractor during construction.	0	This option will impact on existing pedestrian and cyclist routes and road crossings. It is expected that safe routes for pedestrians and cyclists similar to existing or via appropriate diversion routes will be maintained by the contractor during construction.
E1.2 Reliability: Variability in highway user journey times	0	The relative adaptability of this junction type to future changes in flow patterns remains similar to existing roundabout design.	1	Signalisation provides greater adaptability to changes in future flow patterns, allowing for balancing of delay across the approaching arms.	1	Signalisation provides greater adaptability to changes in future flow patterns, allowing for balancing of delay across the approaching arms.	1	Signalisation provides greater adaptability to changes in future flow patterns, allowing for balancing of delay across the approaching arms.
E2. Impact on the Environment								
E2.1 Noise: Construction period	0	Existing traffic noise levels alongside the	0	The overall amount of carriageway widening	0	The addition of the cycle lane would be	0	The work required to construct this option

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
environmental impacts		A4095 have been measured at 71 dB LAeq, 1h. Therefore ambient levels at properties immediately to the south of the A4095 are relatively high and it is unlikely that daytime construction activities, which would mostly be confined to the northern side of the A4095, would give rise to significant noise effects at these properties. However if night-time works were required it is likely that significant noise effects would be experienced by residents living close to the junction (and a negative score would be appropriate).		works required for Option 2 would be of a similar magnitude to those required for Option 1 and therefore similar conclusions as to the potential impact of construction noise on local sensitive receptors may be drawn.		unlikely to give rise to any significant effects over and above those considered for Option 1 and 2. Therefore the same impact from construction noise would be expected.		would be nearly identical to that for Option 2 and as such the same impacts from construction noise and vibration would be expected.
E2.1 Noise: Operation period environmental impacts	1	The increase in vehicle capacity due to the proposed roundabout will potentially lead to a smoother traffic flow with higher speeds and therefore a reduction in road traffic noise. The proposed alignment does not bring traffic any closer to existing properties to the south	0	The traffic modelling indicates that signalisation of the junction would not cause queuing traffic and consequently a reduction in traffic noise. However, the noise from the acceleration of vehicles away from the signalised junction	0	The layout of road traffic for this option is very similar to that for Option 2 and therefore the same conclusions with respect to traffic noise apply. If the addition of the cycle lanes further encouraged a modal shift away from car usage then this could	0	In the vicinity of the junction itself the traffic noise impact is expected to be the same as for Option 2. However, this assessment has been based on a version of the Refined Preferred Option which incorporates a restricted right turn out

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		of the junction and will therefore not lead to traffic noise increases from the realignment of the junction.		could increase the noise level at the closest residential properties. Additionally, if the priority given to buses encourages a shift away from car journeys traffic flows may decrease. The alignment of the A4095 is slightly closer to properties on Juniper Gardens than for Option 1.		benefit traffic noise but the resulting reductions would likely be very small.		of Fringford Road, which could lead to wider traffic reassignment and therefore potential traffic noise increases on other local roads such as Skimmingdish Lane. However, based on the strategic modelling previously undertaken, the number of vehicles making the right turn is very low, and therefore the potential reassignment is not expected to create any significant change in noise.
E2.2 Air Quality: Estimated change in NOx/PM emitted	1	The increase in vehicle capacity due to the proposed roundabout will potentially lead to a smoother traffic flow with higher speeds and therefore potentially lower emissions and pollutant concentrations. It is noted that air quality in the area is good and below the relevant UK air quality objectives. There will also be potential impacts on sensitive receptors due	0	Option 2 will also see smoother traffic flows and therefore impacts in this regard are similar to Option 1. An added benefit of Option 2 is that it would give priority for buses and enhance crossings to promote sustainable travel. This may encourage a shift away from road vehicles so may reduce traffic flow and lower emissions compared to Option 1. However, the	-1	The CYCLOPs junction will promote cycle use but reduce capacity for vehicles compared to Option 1 and 2. As with Option 2, Option 3 would give priority for buses, cyclists and enhance crossings to promote sustainable travel. However, the carriageway is potentially closer to residential properties at the south of the junction compared to Option 1 so there is a potential to	0	The improvements in provision for cyclists and the restriction of the right turn from Fringford Road in the Refined Preferred Option are not expected to have any additional impacts on traffic flows and speeds compared to Option 2. Therefore it is expected that there will be no noticeable difference in terms of air quality impacts to Option 2.

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		to dust and vehicle emissions during construction which will be temporary in nature.		carriageway is potentially closer to residential properties at the south of the junction compared to Option 1 which means there is a potential to increase exposure. Levels of air quality are good in the area and below relevant UK air quality objectives. There will be potential impacts on sensitive receptors due to dust and vehicle emissions during construction but these will be temporary in nature.		increase exposure. Levels of air quality are good in the area and below relevant UK air quality objectives. There will be potential impacts on sensitive receptors due to dust and vehicle emissions during construction but these will be temporary in nature.		
E2.3 Greenhouse gases: Change in CO2/Carbon emissions	1	The increase in vehicle capacity due to the proposed roundabout will potentially lead to a smoother traffic flow with higher speeds and therefore potentially lower CO2 emissions.	1	This Option will also see smoother traffic flows and therefore impacts in this regard are similar to Option 1. However, the signalisation of this option may cause vehicles to work less efficiently as they stop and start. An added benefit of Option 2 is that it would give priority for buses and enhance crossings to promote sustainable travel. This may encourage a shift away	1	The CYCLOPs junction will promote cycle use but reduce capacity for vehicles compared to Options 1 and 2. However, this option would give priority for buses, cyclists and enhance crossings to promote sustainable travel. This may encourage a shift away from road vehicles so may reduce traffic flow and lower emissions compared to Option 1.	1	It is not expected that the Refined Preferred Option will have any noticeable differences to the other options on impacts to CO2 emissions at the junction.

Criteria / Sub-criteria	Option 1 Score	Option 1 Comment	Option 2 Score	Option 2 Comment	Option 3 Score	Option 3 Comment	Refined Preferred Option Score	Refined Preferred Option Comment
				from road vehicles so may reduce traffic flow and lower emissions compared to Option 1.				
E2.4 Landscape: Impact on landscape, including visual impact, such as on the hedgerow	-1	Loss of hedgerow and trees to the north of the western arm (A4095) of the junction, opening up views to the north and increasing visibility of the junction within medium distance views from residents located off Charlotte Avenue. Limited loss of hedgerows to the east of the northern arm (B4100) of the junction.	-1	Loss of hedgerow and trees to the north and south of the western arm (A4095) of the junction, opening up views to the north, increasing visibility of the junction within medium distance views from residents located off Charlotte Avenue. Limited loss of hedgerow to the east of the northern arm (B4100) of the junction. Limited loss of hedgerow and trees to the south of the eastern arm (A4095) of the junction, increasing visibility of the junction within close distance views from residents of Juniper Gardens.	-2	Loss of hedgerow and trees to the north and south of the western arm (A4095) of the junction, opening up views to the north, increasing visibility of the junction within medium distance views from residents located off Charlotte Avenue. Limited loss to hedgerow to the east of the northern arm (B4100) of the junction. Loss of hedgerow and trees to the south of the eastern arm (A4095) of the junction, increasing visibility of the junction within close distance views from residents of Juniper Gardens.	0	Loss of hedgerow and trees is limited to the eastern side of the B4100 (which could be mitigated with new planting), the roundabout and the band of planting within the road corridor of the western arm of the A4095. The planting which provides a buffer and screen between the eastern arm of the A4095 and the residential area to the south will be retained. Similarly there will be no vegetation removal along the northern side of the western arm of the A4095 thereby retaining the boundary vegetation that currently exists. Consequently there would be little change to the site or local landscape character as a result of the Refined Preferred Option. Since undertaking the original sifting appraisal of

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
								Options 1-3, an Arboricultural Impact Assessment Report and Tree Protection Plan has been produced which identifies the vegetation loss associated with the Refined Preferred Option.
E2.5 Streetscape: Impact on streetscape and urban environment	0	Streetscape remains similar to existing conditions.	-1	Design reduces the amount of greenery at and around the junction and increases the amount of paving.	1	The segregated provision for pedestrians and cyclists at the junction, including the contrasting colour markings, is likely to give the area a more urban sense of place, which is compatible with the future vision of the A4095 and the North West Bicester site.	0	The segregated provision for pedestrians and cyclists at the junction, including markings on the pavement and separate crossing facilities, is likely to make the junction appear more user friendly to pedestrians and cyclists. This sense of place is compatible with the future vision of the A4095 and the North West Bicester site. However, the design reduces the amount of greenery at and around the junction and increases the amount of paving.
E2.6 Historic environment: Impact	0	Majority of the listed buildings are associated	0	Majority of the listed buildings are	0	Majority of the listed buildings are	0	Majority of the listed buildings are

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
on historic landfill, listed buildings and scheduled monuments		with the First and Second World War Bicester Airfield which forms their setting, and no direct impact is anticipated as a result of construction works for Option 1. Only the Grade II* Listed Church of St Laurence and Grade II Home Farmhouse have some limited potential to be affected by the development of the Site, due to their setting that includes the Site or views towards/from it, albeit which have been interrupted by modern development of the existing road system. There is a potential for unknown archaeological assets within the Site, which would likely be fully truncated to the final depth of construction.		associated with the First and Second World War Bicester Airfield which forms their setting, and no direct impact is anticipated as a result of construction works for Option 2. Only the Grade II* Listed Church of St Laurence and Grade II Home Farmhouse have some limited potential to be affected by the development of the Site, due to their setting that includes the Site or views towards/from it, albeit which have been interrupted by modern development of the existing road system. There is a potential for unknown archaeological assets within the Site, which would likely be fully truncated to the final depth of construction.		associated with the First and Second World War Bicester Airfield which forms their setting, and no direct impact is anticipated as a result of construction works for Option 3. Only the Grade II* Listed Church of St Laurence and Grade II Home Farmhouse have some limited potential to be affected by the development of the Site, due to their setting that includes the Site or views towards/from it, albeit which have been interrupted by modern development of the existing road system. There is a potential for unknown archaeological assets within the Site, which would likely be fully truncated to the final depth of construction.		associated with the First and Second World War Bicester Airfield which forms their setting, and no direct impact is anticipated as a result of construction works for the Refined Preferred Option. Only the Grade II* Listed Church of St Laurence and Grade II Home Farmhouse have some limited potential to be affected by the development of the Site, due to their setting that includes the Site or views towards/from it, albeit which have been interrupted by modern development of the existing road system. There is a potential for unknown archaeological assets within the Site, which would likely be fully truncated to the final depth of construction.
E2.7 Biodiversity: Impact on biodiversity	0	There is the potential loss of sections of hedgerow and individual trees for Option 1. This Option is unlikely to impact protected or	0	There is the potential loss of sections of hedgerow and individual trees for Option 2. This Option is unlikely to impact	0	There is the potential loss of sections of hedgerow and individual trees for Option 3. This Option is unlikely to impact	0	The Refined Preferred Option will result in the loss of sections of species-poor hedgerow and individual trees. This option will not

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		notable species and habitats and designated nature conservation sites. Note - subject to further ecological survey, where recommended.		protected or notable species and habitats and designated nature conservation sites. Note - subject to further ecological survey, where recommended.		protected or notable species and habitats and designated nature conservation sites. Note - subject to further ecological survey, where recommended.		impact protected or notable species and habitats and designated nature conservation sites.
E2.8 Water environment: Flood mitigation	-1	Option 1 is located in Flood Zone 1 and would cross a small area of low surface water flood risk on the existing A4095 carriageway, east of the roundabout. Increased runoff from the greater impermeable area for the scheme (compared to the existing situation) may cause an increase in flood risk in the receiving watercourse if not mitigated.	-1	Option 2 is located in Flood Zone 1 and would cross a small area of low surface water flood risk on the existing A4095 carriageway, east of the roundabout. Increased runoff from the greater impermeable area for the scheme (compared to the existing situation, and with greater increase than option 1 and 3) may cause an increase in flood risk in the receiving watercourse if not mitigated.	-1	Option 3 is located in Flood Zone 1 and would cross a small area of low surface water flood risk on the existing A4095 carriageway, east of the roundabout. Increased runoff from the greater impermeable area for the scheme (compared to the existing situation) may cause an increase in flood risk in the receiving watercourse if not mitigated.	-1	The Refined Preferred Option is located in Flood Zone 1 and would cross a small area of low surface water flood risk on the existing A4095 carriageway, east of the roundabout. Increased runoff from the greater impermeable area for the scheme (compared to the existing situation) may cause an increase in flood risk in the receiving watercourse if not mitigated.
E2.8 Water environment: Water quality	-1	There would be an increase in impermeable area in comparison to the existing situation which would increase surface water runoff from the road (mobilising pollutants including dissolved metals,	-1	There would be an increase in impermeable area in comparison to the existing situation (and more so for Option 2 than for Option 1 and 3) which would increase surface water runoff from the road	-1	There would be an increase in impermeable area in comparison to the existing situation which would increase surface water runoff from the road (mobilising pollutants including dissolved metals,	-1	There would be an increase in impermeable area in comparison to the existing situation (and seemingly more so than for Options 1-3) which would increase surface water runoff from the road

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		sediments and deicant salts) leading to potential water quality deterioration in the receiving watercourse if not mitigated.		(mobilising pollutants including dissolved metals, sediments and deicant salts) leading to potential water quality deterioration in the receiving watercourse if not mitigated.		sediments and deicant salts) leading to potential water quality deterioration in the receiving watercourse if not mitigated.		(mobilising pollutants including dissolved metals, sediments and deicant salts) leading to potential water quality deterioration in the receiving watercourse if not mitigated.
E3. Impact on Society								
E3.1 Non-business users including commuters and leisure/education: Highway user travel time changes	1	Travel times through the network improve for private motorised vehicles compared to the Do Minimum scenario.	1	Travel times through the network improve for private motorised vehicles compared to the Do Minimum scenario.	-1	Travel times through the network worsen for private motorised vehicles compared to the Do Minimum scenario.	1	Travel times through the network improve for private motorised vehicles compared to the Do Minimum scenario.
E3.1 Non-business users including commuters and leisure/education: Bus travel time changes	0	Travel times for buses through the network are consistent with those in the Do Minimum scenario.	0	Travel times for buses through the network are consistent with those in the Do Minimum scenario.	-1	Travel times through the network worsen for buses compared to the Do Minimum scenario.	0	Travel times for buses through the network are consistent with those in the Do Minimum scenario.
E3.1 Non-business users including commuters and leisure/education: Walk travel time changes	0	Travel times for pedestrians through the network are consistent with those in the Do Minimum scenario.	1	Travel times for pedestrians through the network improve compared to the Do Minimum scenario.	1	Travel times for pedestrians through the network improve compared to the Do Minimum scenario.	1	Travel times for pedestrians through the network improve compared to the Do Minimum scenario.
E3.1 Non-business users including commuters and leisure/education: Cycle travel time changes	0	Travel times for cyclists through the network are consistent with those in the Do Minimum scenario.	1	Travel times for cyclists through the network improve compared to the Do Minimum scenario.	0	Travel times for cyclists through the network are consistent with those in the Do Minimum scenario.	1	Travel times for cyclists through the network improve compared to the Do Minimum scenario.
E3.2 Physical activity: Health benefits	0	While crossing facilities for pedestrians and	1	Crossing facilities for pedestrians and cyclists	2	The design clearly prioritises travel by walk	1	Crossing facilities for pedestrians and

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		cyclists are somewhat improved compared to existing provision, the improvements are not likely to have a considerable impact on levels of active travel.		are significantly improved compared to existing provision, which may encourage active travel.		and cycle and could therefore have a considerable impact on levels of active travel.		cyclists are significantly improved compared to existing provision, which may encourage active travel.
E3.3 Accidents: Impact on rate of incidents	-1	Conventional roundabout layout would be familiar to all users which would reduce propensity for incidents. Uncontrolled crossings do not mitigate for conflict points between modes of travel and may lead to a higher propensity for incidents. No segregation of cyclist and pedestrian modes of travel. Southern arm of junction retains use of uncontrolled crossing facilities with a higher propensity for incidents.	0	Conventional signalised crossroads layout would be familiar to all users which would reduce propensity for incidents. Controlled crossings do mitigate for conflict points between modes of travel and may lead to an average propensity for incidents. No segregation of cyclist and pedestrian modes of travel.	1	Higher level of control at crossings compared with Option 2 has more mitigation for conflict points between modes of travel and may lead to a lower propensity for incidents. Higher degree of segregation of cyclist and pedestrian modes of travel. However, Option 3 presents a non-conventional signalised crossroads layout would be unfamiliar to all users, which could increase propensity for incidents.	2	Higher level of control at crossings compared with Option 2 and Option 3. This option has more mitigation for conflict points between modes of travel and may lead to a lower propensity for incidents. Highest degree of segregation of cyclist and pedestrian modes of travel. However, Refined Preferred Option presents a non-conventional signalised crossroads layout which would be unfamiliar to all users, which could increase propensity for incidents.
E3.4 Severance: Severance	0	While crossing facilities for pedestrians and cyclists are somewhat	1	Crossing facilities for pedestrians and cyclists are significantly	1	Crossing facilities for pedestrians and cyclists are significantly	1	Crossing facilities for pedestrians and cyclists are significantly

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		improved compared to existing provision, travel distances to crossings remain the same.		improved and provided at the main desire lines, with shorter travel distances needed to cross the A4095 and Banbury Road.		improved and provided at the main desire lines, with shorter travel distances needed to cross the A4095 and Banbury Road.		improved and provided at the main desire lines, with shorter travel distances needed to cross the A4095 and Banbury Road.
E3.5 Accessibility: E.g. access implications to Fringford Road if option prohibits U-turn through junction, and in terms of queues blocking back and prohibiting access to side roads	1	Queues approaching the junction and blocking back to nearby junctions are significantly decreased compared to the Do Minimum scenario, especially for Fringford Road, Heather Road and Lucerne Avenue.	2	Queues approaching the junction and blocking back to nearby junctions are significantly decreased compared to the Do Minimum scenario, especially for Fringford Road, Heather Road and Lucerne Avenue. Signalisation provides greater adaptability to changes in future flow patterns, allowing for balancing of delay across the approaching arms.	-2	While signalisation allows for greater adaptability to changes in future flow patterns, queues approaching the junction and blocking back to nearby junctions are increased compared to the Do Minimum scenario.	2	Queues approaching the junction and blocking back to nearby junctions are significantly decreased compared to the Do Minimum scenario, especially for Fringford Road, Heather Road and Lucerne Avenue. Signalisation provides greater adaptability to changes in future flow patterns, allowing for balancing of delay across the approaching arms.
Total Economic Case Score	4		8		-3		11	

Table 30. Sift 2 Results – Financial Case

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
F1 Capital and Revenue Costs								
F1.1 Infrastructure capital costs, operating and maintenance costs: Capital cost estimate	-2	This option offers the lowest cost estimate value. This has the least effect on the existing area and least impact on Road lighting. However, all options considered to be expensive. Scoring based on information available at the time of Sift 2 and may be subject to revision.	-2	This option is the middle cost estimate value, it is in excess of £2.5m more than the lowest estimate. More disruption during construction. However, all options considered to be expensive. Scoring based on information available at the time of Sift 2 and may be subject to revision.	-2	This option is the highest cost estimate value, it is in excess of £4.5m more than the lowest estimate. This has an additional increase in Traffic signalling and more street lighting, therefore ongoing costs will increase. However, all options considered to be expensive. Scoring based on information available at the time of Sift 2 and may be subject to revision.	-2	This Refined Preferred Option estimate fits in between Options 2 and 3. This estimate includes inputs based on the review meeting of stage 1 option estimates with OCC. This has resulted in a slight lowering of the costs however the overall value is considered to be expensive. Scoring based on information available at the time of Sift 2 and may be subject to revision.
Total Financial Case Score	-2		-2		-2		-2	

Table 31. Sift 2 Results – Management Case

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
M1. Practical Feasibility								
M1.1 Engineering, interfaces, complexity and feasibility: Design and construction - including programme, design standards, etc	1	Least complex design out of the three options: - substantial sections of carriageway can be constructed offline from existing carriageway and then used for traffic while other sections of existing carriageway are altered. - Minimal new technology infrastructure required. - larger overall scheme footprint and more new carriageway required than other options. Overall, this is expected to have the shortest construction period, simplest to construct and lowest risk profile compared	0	Typical UK type signalised junction, including appropriate amount of technology: - more complex traffic management than Option 1 because there is less additional road space being created to use for temporary traffic management - reduced offline new carriageway with less flexibility for temporary traffic management. Overall, this is expected to have a median construction and technology commissioning period, with a moderate level of complexity and average risk profile compared to the other options.	-1	More complex type of junction relatively uncommon in the UK, including more technology required: - more complex traffic management than Option 1 because there is less additional road space being created to use for temporary traffic management - reduced offline new carriageway with less flexibility for temporary traffic management. - higher complexity and potential to disrupt traffic during construction of more complex paving / surfacing arrangement and additional signs and signal controls. - more complex surface drainage design required to avoid conflicts with pedestrian and	0	More complex type of junction, relatively uncommon in the UK, including more technology required: - more complex traffic management than Option 1 because there is less additional road space being created to use for temporary traffic management. - reduced offline new carriageway with less flexibility for temporary traffic management. - higher complexity and potential to disrupt traffic during construction of more complex paving / surfacing arrangement and additional signs and signal controls. - more complex surface drainage design required to avoid conflicts with pedestrian and cyclist crossing points. Due to the segregated footway and bi-

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		with the other options.				cyclist crossing points. Overall, this is expected to take the longest to construct and commission the technology. a higher level of complexity and higher risk profile compared to the other options.		directional cycleway a larger footprint is required, this will benefit the construction phase plan and reduce complexity when placing underground services such as drainage and utilities. The larger footprint will support the drainage strategy as there is space for attenuation equipment.
M1.2 Construction effect on the network: Impact of construction on the network, e.g. traffic management and delays	1	Overall, this is expected to have the shortest construction period and be the simplest to construct compared with the other options. There are no other known schemes running in parallel to this which may cause an impact to the construction of this Option.	0	Overall, this is expected to have a median construction period and degree of complexity to construct compared with the other options. There are no other known schemes running in parallel to this which may cause an impact to the construction of this Option.	-1	Overall, this is expected to have a longer construction period and higher degree of complexity to construct compared with the other options. There are no other known schemes running in parallel to this which may cause an impact to the construction of this Option.	-1	Overall, this is expected to have a longer construction period and higher degree of complexity to construct compared with the other options. There are no other known schemes running in parallel to this which may cause an impact to the construction of this Option.
M1.3 Possibility to change option – option flexibility: Future proofing	0	Roundabout option footprint would have a low potential for increasing capacity unless additional	0	Signalised junction footprint would have a low potential for increasing capacity unless additional road space is provided.	0	Cyclops junction footprint would have a low potential for increasing capacity unless additional	0	Refined Preferred Option junction footprint would have a low potential for increasing capacity

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		road space is provided. Overall future proofing ability considered to be the same for all options.		Overall future proofing ability considered to be the same for all options.		road space is provided. Overall future proofing ability considered to be the same for all options.		unless additional road space is provided. Overall future proofing ability considered to be the same for all options.
M2. Stakeholder Acceptability								
M2.1 Stakeholder acceptability/interest: Stakeholders for example: Local authorities, delivery partners, statutory bodies, land owners, utility companies, community groups	1	Based on the stakeholder responses to the public consultation, the majority of the responses preferred Option 3. A small minority preferred Option 1, whereas no stakeholder preferred Option 2. Two stakeholders did not prefer any of the options.	0	Based on the stakeholder responses to the public consultation, the majority of the responses preferred Option 3. A small minority preferred Option 1, whereas no stakeholder preferred Option 2. Two stakeholders did not prefer any of the options.	2	Based on the stakeholder responses to the public consultation, the majority of the responses preferred Option 3. A small minority preferred Option 1, whereas no stakeholder preferred Option 2. Two stakeholders did not prefer any of the options.	Not applicable	Stakeholders have not been consulted on the Refined Preferred Option.
M3. Public Acceptability/Interest								
M3.1 Public acceptability/interest: Public view on scheme components, including public consultation responses	1	Based on the stakeholder responses to the public consultation, the majority of the responses preferred Option 3. A small minority preferred Option 1, whereas no stakeholder preferred Option 2.	0	Based on the stakeholder responses to the public consultation, the majority of the responses preferred Option 3. A small minority preferred Option 1, whereas no stakeholder preferred Option 2. Two	2	Based on the stakeholder responses to the public consultation, the majority of the responses preferred Option 3. A small minority preferred Option 1, whereas no stakeholder preferred Option 2.	Not applicable	The public has not been consulted on the Refined Preferred Option.

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
		Two stakeholders did not prefer any of the options.		stakeholders did not prefer any of the options.		Two stakeholders did not prefer any of the options.		
Total Management Case Score	5		0		1		-1	

Table 32. Sift 2 Results – Commercial Case

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
C1. Complexity of Delivery								
C1.1 Dependency and interface risk in relation to other projects, timescale of delivery, contractual complexity and risks: Highways design	1	Most simple to design, construct and lowest risk	0	Standard design, average level of complexity and risk to delivery	-1	Novel Highway design, higher level of complexity	-1	Generally a standard design with elements from the more complex CYCLOPS option. On balance it is similar to the Signalised junction
C1.1 Dependency and interface risk in relation to other projects, timescale of delivery, contractual complexity and risks: Design of pedestrian facilities	1	Standardised road crossings with average level of complexity and risk	1	Standardised road crossings with average level of complexity and risk	-1	Dual parallel crossings in junction are more complex to design and deliver with a higher level of risk	0	Incorporating the bi-directional cycle ways plus pedestrian crossing is more complex to design and deliver with a slightly higher level of risk.
C1.1 Dependency and interface risk in relation to	1	Standardised road crossings with average	1	Standardised road crossings with average	-1	Dual parallel crossings in junction are more complex to design and	0	Incorporating the bi-directional cycle ways plus pedestrian crossing

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
other projects, timescale of delivery, contractual complexity and risks: Design of cycling facilities		level of complexity and risk		level of complexity and risk		deliver with a higher level of risk		is more complex to design and deliver with a slightly higher level of risk
C1.1 Dependency and interface risk in relation to other projects, timescale of delivery, contractual complexity and risks: Interface with other schemes considered	0	All options are likely to have the same level of disruption to the operation of the highway during the delivery. There is also potential that the programme for the realignment of the A4095 and Banbury Road Roundabout scheme will overlap and a coordinated approach to network management will need to be undertaken. This will be present in all three options.	0	All options are likely to have the same level of disruption to the operation of the highway during the delivery. There is also potential that the programme for the realignment of the A4095 and Banbury Road Roundabout scheme will overlap and a coordinated approach to network management will need to be undertaken. This will be present in all three options.	0	All options are likely to have the same level of disruption to the operation of the highway during the delivery. There is also potential that the programme for the realignment of the A4095 and Banbury Road Roundabout scheme will overlap and a coordinated approach to network management will need to be undertaken. This will be present in all three options.	0	All options are likely to have the same level of disruption to the operation of the highway during the delivery. There is also potential that the programme for the realignment of the A4095 and Banbury Road Roundabout scheme will overlap and a coordinated approach to network management will need to be undertaken. This will be present in all three options.
C2. Flexibility								
C2.1 Possibility to change option – option flexibility: Breaking down of schemes to ease the delivery (specialist partners for example)	0	Low potential for phased delivery or change of type of option at later stage.	0	Low potential for phased delivery or change of type of option at later stage.	0	Low potential for phased delivery or change of type of option at later stage.	0	Low potential for phased delivery or change of type of option at later stage.
C3. Funding and Income								

Criteria / Sub-criteria	Option 1		Option 2		Option 3		Refined Preferred Option	
	Score	Comment	Score	Comment	Score	Comment	Score	Comment
C3.1 Scope to meet funding criteria: MHCLG funding conditions	-2	All options were expected to be outside the currently available funding at the time. Scoring based on information available at the time of Sift 2 and may be subject to revision.	-2	All options were expected to be outside the currently available funding at the time. Scoring based on information available at the time of Sift 2 and may be subject to revision.	-2	All options were expected to be outside the currently available funding at the time. Scoring based on information available at the time of Sift 2 and may be subject to revision.	-2	All options were expected to be outside the currently available funding at the time. Scoring based on information available at the time of Sift 2 and may be subject to revision.
Total Commercial Case Score	1		0		-5		-3	

Table 33. Sift 2 Results – Total Scores

Score	Option 1	Option 2	Option 3	Refined Preferred Option
Strategic Case	1	3	2	5
Economic Case	4	8	-3	11
Financial Case	-2	-2	-2	-2
Management Case	5	0	1	-1
Commercial Case	1	0	-5	-3
Total	9	9	-7	10

Appendix E **Turbo Roundabout**

6.1.5 A Turbo roundabout junction design was considered as part of the Longlist of options for the Scheme. It was sifted out in the appraisal of the Longlist (Sift 1) and therefore not taken forward as part of the Shortlist of options. This section outlines the reasons why a Turbo roundabout was not taken forward.

6.1.6 A Turbo roundabout is a junction design, which provides separation of the roundabout's circulatory lanes. The separation requires drivers to choose their direction before entering the roundabout. The design is generally understood to improve safety for motorised vehicles as it reduces speeds, conflict and weaving through the junction. This junction is mainly introduced where vehicle flows are high, where pedestrian and cycles are absent from the local area or are accommodated through segregation/ grade-separation, and are more typically provided on the strategic highway routes. An example of a Turbo roundabout design is provided in Figure 47.

Figure 47. Example of a Turbo Roundabout

6.1.7 Although it provides many of the benefits of the 'Higher capacity roundabout' option (Option #1 in the Shortlisted options) and provides some additional safety benefits, the Turbo roundabout design was sifted out because of a number of key disbenefits, specifically:

- The existing and forecast flow patterns for motorised vehicles through the junction indicate that a Turbo roundabout would not be an optimum solution. Turbo roundabouts work best where there is a balanced flow pattern across the arms of the junction. However, at the A4095 / B4100 Banbury Road roundabout, traffic volumes on some movements (turns from one arm to another) are high with little demand for some other movements;
- It is likely that the Turbo roundabout design would have to be bigger and require more land take than the Higher capacity roundabout due to the provision of at grade separation between circulatory lanes, and since longer flares would be needed to establish separation on approach lanes;

- A Turbo roundabout design would require two lane entries and exits to enable the lane separation. In this design, provision for pedestrians and cyclists is either uncontrolled or controlled. An uncontrolled option would not address the scheme objectives of actively supporting pedestrians and cyclists. A controlled zebra crossing type arrangement has significant safety concerns due to sighting issues on those crossings, with lane 1 vehicles blocking forward visibility of vehicles in lane 2 and vice a versa depending on crossing origin. Signalising the crossings would effectively make the layout operate similar to a more traditional roundabout with signalised crossings;
- For the above reason, it was assumed that pedestrian and cyclist crossings would need to be provided away from the junction and signalised, due to the longer crossing lengths. To ensure that vehicles approaching the roundabout are in the correct lane, the entry flares in the Turbo roundabout design would have to be longer than in the Higher capacity roundabout option. This would require signalised crossing facilities to be provided further away from the roundabout, compared to the Higher capacity roundabout option. For this reason, this option was not considered likely to provide good pedestrian and cycle links across the junction;
- Due to it being a relatively new design in the UK, there was also considered to be a risk that the format of the Turbo roundabout being unfamiliar could lead to users weaving and lane changing, which may have safety implications on the approach to the junction. This was not considered to be a risk for the Higher capacity roundabout option, which is based on a standard roundabout design familiar to UK road users; and
- While a Turbo roundabout design would improve safety for cyclists travelling on the carriageway, the design does not integrate well with the existing off-road provision for pedestrian and cyclists.

6.1.8 Turbo roundabouts are generally more common in the Netherlands than in the UK. Approaches to roundabout design vary in the UK compared to continental Europe and the road rules are also different. It should therefore be noted that junction designs which work outside the UK may not work or even be feasible in the UK, due to differences in regulatory frameworks.

6.1.9 Turbo roundabouts are sometimes referred to as ‘Dutch-style roundabouts’ due to their prevalence in the Netherlands, and by association with the term ‘Dutch’ assumed to be designed for cyclists. However, Dutch-style roundabouts are significantly different to Turbo roundabouts in that their purpose is to give priority to cyclists. A Dutch-style roundabout has: large zebra crossings at the entries and exits, and single lane entries and exits for motorised vehicles; cyclists are given a dedicated lane through the roundabout and have right of way; and, to promote lower speeds, the entries and exits for motorised traffic are narrower than in a standard roundabout. These characteristics, which promote or support cyclists, are not features of the Turbo roundabout.

6.1.10 It is worth noting that a Dutch-style roundabout design was also included in the Longlist of options for the Scheme. This junction design was sifted out due to the design requirements placing a significant capacity constraint on motorised vehicles, likely to result in a much lower capacity than the existing junction. The CYCLOPS (Cycle Optimised Protected Signals) junction (Option #3 in the Shortlisted options) was taken forward to the Shortlist instead as it was considered more likely to balance the needs of active modes with the need to accommodate the planned development growth in Bicester.

Appendix F **Simultaneous Green for Cyclists**

Introduction

6.1.11 The purpose of this appendix is to assess the possible operation of a 'Simultaneous Green' option, which was suggested during stakeholder consultation as an option that had not previously been considered. A concept layout is shown in Figure 48 below, which is taken from an online blog.

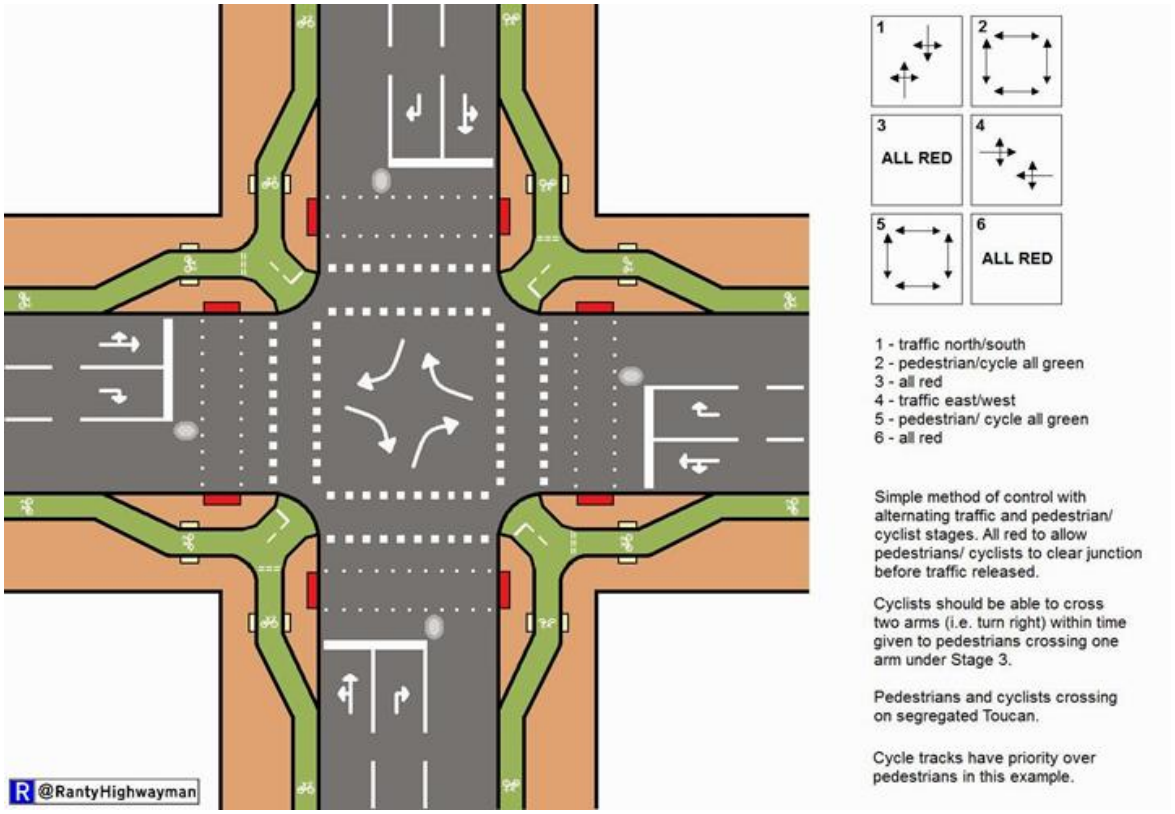

Figure 48. Example of Illustrative 'Simultaneous Green' Layout

6.1.12 The Simultaneous Green option would provide a benefit to cyclists, as all cyclist movements across the junction can take place simultaneously with cyclists making right turning movements across the junction at the same time - this would reduce delay for cyclists and minimise the amount of time required for the cycle all-movements stage. The cycle stage would take place at the same time as a stage which accommodates pedestrian phases, although how the cycle movements connect with surrounding cycle infrastructure would need further review.

6.1.13 In the Simultaneous Green option considered in this analysis, pedestrian crossings are provided only on the southern and western arms of the junction. The cycle stage will be called at the same time as the pedestrian stage, but will be shorter than required to accommodate pedestrians, so the traffic movements between the B4100 and A4095 can start and run alongside the remaining part of the pedestrian stage, as indicated in Figure 49 below.

6.1.14 If pedestrian crossings are provided across all arms of the junction in a Simultaneous Green option, then the operation will be similar to the CYCLOPS (Option #3) which was modelled as part of the Sift 2 assessment, as the all-red traffic stage length would be governed by the provision of pedestrian crossings over all arms of the junction and the associated crossing and clearance times. AECOM has therefore considered a 'best case' assumption for the Simultaneous Green option, where pedestrian facilities are

only provided across the southern and western arms of the junction, with the all-red stage only running to accommodate the cycling movements to/ from all arms of the junction.

6.1.15 This analysis provides an estimation of the impact that the Simultaneous Green option would have on general traffic capacity. The estimated impact has been compared against the Refined Preferred Option and the CYCLOPS junction designs, as the expected capacity performance is expected to be somewhere between these two previously modelled options.

Analysis of Simultaneous Green Signal Operation

6.1.16 In the Simultaneous Green junction layout considered for this assessment, it is assumed that pedestrian crossing facilities would only be provided at the western and southern arms of the junction (meeting the key desire lines for pedestrians) as shown in Figure 49.

6.1.17 The interstage is the time between the end of green in one stage and the start of green/ amber for the following stage. The interstage between the end of the traffic phases and start of the pedestrian/ cycle phases is assumed to be the same in the Simultaneous Green option as the Refined Preferred Option and CYCLOPS options (8 seconds). This allows time for traffic to clear the junction before pedestrian and cycle movements can safely start.

6.1.18 It is assumed that cyclists and pedestrians would receive green within an all-red traffic stage. The green time for the all-red stage has been estimated as 6 seconds. The minimum green time for the Simultaneous Green option has been reduced from the minimum green time of 8 seconds assumed for the CYCLOPS and Refined Preferred Option layouts. The 8 seconds minimum green time assumed in the CYCLOPS and Refined Preferred option allows the cyclist to complete two crossings within one cycle, which will no longer be required in the Simultaneous Green option, as cyclists can make more direct movements in a shorter time. These assumptions have been based on an average cyclist speed of 20km/h (or 12.5 mph) as recommended in **LTN 1/20 Cycle Infrastructure Design**.

6.1.19 The interstage between the all-red and the pedestrian + traffic stage would be determined by the intergreens between the cycle phases and the traffic phases, which has been calculated based on the estimated distance between the cycle stop lines and the conflict points with the general traffic (approximately 25 metres based on the estimated junction layout). Following the information from Table 10-4 from LTN 1/20, it has been assumed that cyclists will require a 10 seconds intergreen to safely clear the junction.

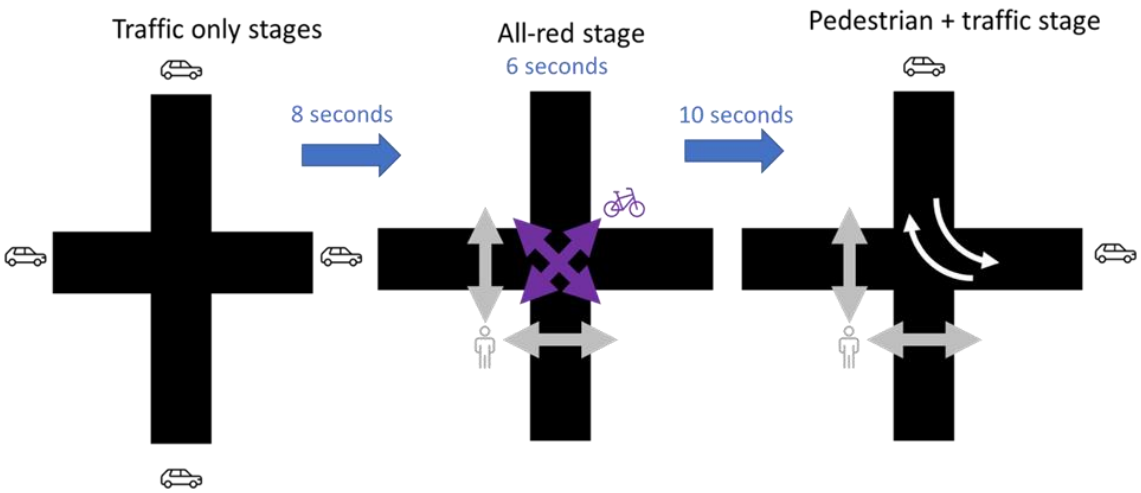

Figure 49. Schematic of the Operation of the Simultaneous Green Option

6.1.20 Based on the above analysis, the resulting length of the all-red traffic stage in the Simultaneous Green option would be 24 seconds (8 seconds preceding intergreen + 6 seconds green time + 10 seconds following intergreen).

6.1.21 In the CYCLOPS option, the pedestrian crossings are provided on all arms of the junction, so it is not possible to stage pedestrian and cycle movements alongside traffic movements. The pedestrian + traffic stage above is therefore not possible. The all-red traffic stage requires 31 seconds every cycle, which includes the preceding intergreen (8 seconds), the minimum duration of the pedestrian and cyclist stage (assumed to be 8 seconds to allow cyclists to cross two arms of the junction) and the following intergreen to allow pedestrians to safely clear the junction (15 seconds). The operation of the CYCLOPS junction is illustrated in Figure 50.

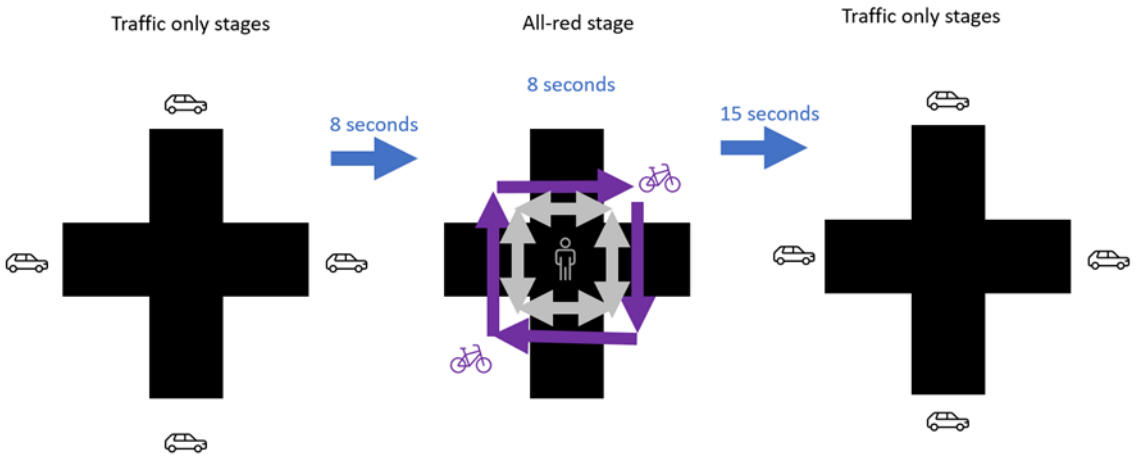

Figure 50. Schematic of the Operation of the CYCLOPS Option

6.1.22 In the Refined Preferred Option layout, the pedestrian and cycle movements do not require an all-red stage, as they can take place within the pedestrian + traffic stage. The all-red time is reduced to only 10 seconds, which is the time required for the interstage between the traffic phases and the pedestrian/ cycle + traffic stage: the pedestrian green time and following intergreen for pedestrians to clear the junction happen while traffic is also moving. The operation of the Refined Preferred Option junction is illustrated in Figure 51.

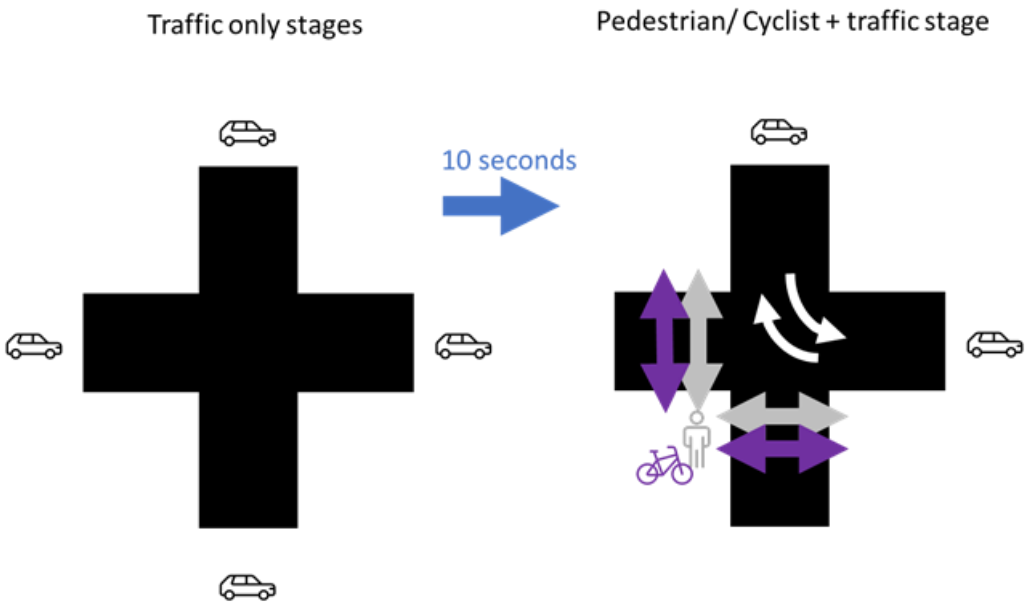

Figure 51. Schematic of the Operation of the Refined Preferred Option

6.1.23 The durations of the all-red traffic stages for the options compared are shown in Table 34 below.

Table 34. Comparison of All-red Traffic Time Required for each Option

Junction Layout	Interstage before Pedestrian & Cycle Stage	Green time required for Pedestrian & Cycle Stage	Interstage after Pedestrian & Cycle Stage	Total red time for Motorised Traffic
Refined Preferred Option	10 seconds	- (with Traffic)	- (with Traffic)	10 seconds
Simultaneous Green	8 seconds	6 seconds	10 seconds	24 seconds
CYCLOPS	8 seconds	8 seconds	15 seconds	31 seconds

6.1.24 The analysis shows that there may be a small reduction in the level of traffic delay associated with the Simultaneous Green option compared to CYCLOPS option, which was modelled and forecast to operate with significantly less vehicle capacity than the existing roundabout. However, the Refined Preferred Option operates without significant spare traffic capacity in the 2037 assessment year. Given that the all-red stage required by the Simultaneous Green junction is significantly longer (approximately 14 seconds for every cycle of the signals) than the Refined Preferred Option, it is expected to result in a significant reduction in general traffic capacity at the junction.

6.1.25 Some simple/ first principles analysis has been undertaken, to assess the likely reduction in throughput that would be seen in the Simultaneous Green option, relative to the Refined Preferred Option. The indicative impact of the additional 14 seconds of all-red traffic time is as follows:

- Assuming a 120 second cycle time, there are 30 cycles of the signals every hour. There are therefore approximately 520 seconds less green time available across the hour (120 * 30);
- A signalised traffic lane is typically assumed to accommodate approximately 1,800 vehicles per hour, given a constant green signal (although this is

impacted by various factors). This translates to approximately 0.5 vehicles per second/ per lane (1800/ 60/ 60); and

- There would therefore be a reduction in capacity of approximately 520 vehicles per hour across two lanes, assuming that the green time would be taken from the stage where the B4100 and A4095 run together (520*0.5*2).

6.1.26 The above analysis indicates that there would be long queues at the junction with the Simultaneous Green option, due to a reduction in capacity of approximately 500 vehicles per hour as compared to the Refined Preferred Option.

Conclusions

6.1.27 The Simultaneous Green option offers additional benefits for cyclists compared to the CYCLOPS and Refined Preferred Option layouts, as it minimises cycle travel times through the junction for right turning movements. In addition, it could provide more capacity for general traffic compared to the CYCLOPS option, assuming pedestrian facilities are not provided on all arms of the junction. However, the Simultaneous Green option only provides a relatively small improvement in terms of green time available for traffic compared to the CYCLOPS option - the CYCLOPS option has been modelled and has been shown to be significantly over capacity.

6.1.28 It was not considered necessary or proportionate to model the Simultaneous Green option in Vissim, given that the analysis of available green time provides a clear conclusion that this option would result in unacceptable impact on motorised traffic.

6.1.29 The analysis has not considered how cycle facilities might connect with the surrounding off-street cycle infrastructure.

6.1.30 This analysis has not considered the implications of the layout on pedestrians, although it is noted that pedestrians crossings would need to be provided outside of cycle facilities in this option, which would result in longer pedestrian crossings and travel which would be less direct, due to the need to cross the cycle lanes. It is therefore expected that this option would result in less optimum facilities being provided for pedestrians.

Appendix G **Sift 3 Results – TAG Worksheets**

Noise Workbook - Worksheet 1

Proposal Name: Banbury Roundabout

Present Value Base Year	2010
Current Year	2021
Proposal Opening year:	2022
Project (Road, Rail or Aviation):	road

Net present value of change in noise (£):	£166,853

*positive value reflects a **net benefit** (i.e. a reduction in noise)

Net present value of impact on sleep disturbance (£):	£63,534
Net present value of impact on amenity (£):	£73,765
Net present value of impact on AMI (£):	£10,326
Net present value of impact on stroke (£):	£7,657
Net present value of impact on dementia (£):	£11,571

Quantitative results

Households experiencing increased daytime noise in forecast year:	6
Households experiencing reduced daytime noise in forecast year:	59
Households experiencing increased night time noise in forecast year:	3
Households experiencing reduced night time noise in forecast year:	21

Qualitative Comments:

Total of 938 residential buildings in the quantitative noise prediction study area.

Data Sources:

Detailed noise assessment predicted $L_{A10,18h}$ dB façade (day) and $L_{Aeq,8h}$ dB free-field (night)

$L_{A10,18h}$ dB façade (day) converted to $L_{Aeq,16h}$ dB façade (day) by subtraction of 2 dB as per TAG guidance

Residential buildings identified via addressbase and aerial photography

Results are provided for façade with the greaest magnitude of change $L_{A10,18h}$ traffic noise level in the with scheme 2022 scenario

Day-time results are provided for the ground floor of each residential building

Night-time results are provided for the top floor of each residential building e.g. height 1.5m for 1 storey, 4m for 2 storey etc.

Figure 52. Sift 3 Results – Noise Appraisal – TAG Worksheet

PM2.5, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	375	444	363	359	1541
Total properties across all routes (some)	381	441	361	358	1541
Do-minimum PM2.5 assessment across all routes	3674.10	4320.80	3522.00	3469.20	Total assessment PM2.5 (I): 14986.10
Do-something PM2.5 assessment across all routes	3736.00	4294.20	3502.20	3459.90	Total assessment PM2.5 (II): 14992.30
Net total assessment for PM2.5, all routes (II-I)					6.20
Number of properties with an improvement					*1027*
Number of properties with no change					*197*
Number of properties with a deterioration					*317*
Reference Sources:	DMRB V8_EFTV10 Final Spreadsheet				
Quantitative Measures:	There are 1027 properties predicted to experience an improvement, 197 properties predicted to experience no change and 317 properties predicted to experience a deterioration				
Assessment Scores:	There is a net total assessment score of 6.20 across all routes				
Qualitative Comments:	DMRB predictions are not verified.				
	A net disbenefit is observed due to the Scheme.				

NO_2, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	375	444	363	359	1541
Total properties across all routes (some)	381	441	361	358	1541
Do-minimum NO_2 assessment across all routes	3424.40	3881.20	3131.50	3065.50	Total assessment NO_2 (I): 13502.60
Do-something NO_2 assessment across all routes	3527.40	3875.70	3124.90	3081.80	Total assessment NO_2 (II): 13609.80
Net total assessment for NO_2, all routes (II-I)					107.20
Number of properties with an improvement					*576*
Number of properties with no change					*6*
Number of properties with a deterioration					*959*
Reference Sources:	DMRB V8_EFTV10 Final Spreadsheet				
Quantitative Measures:	There are 576 properties predicted to experience an improvement, 6 properties predicted to experience no change and 959 properties predicted to experience a deterioration				
Assessment Scores:	There is a net total assessment score of 107.20 across all routes				
Qualitative Comments:	DMRB predictions are not verified.				
	A net disbenefit is observed due to the Scheme.				

Figure 53. Sift 3 Results – Air Quality Appraisal – 2022 Opening Year – TAG Worksheet

PM2.5, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	375	444	363	359	1541
Total properties across all routes (some)	381	441	361	358	1541
Do-minimum PM2.5 assessment across all routes	3498.50	4113.30	3347.50	3304.20	Total assessment PM2.5 (I): 14263.50
Do-something PM2.5 assessment across all routes	3570.60	4091.50	3328.90	3295.30	Total assessment PM2.5 (II): 14286.30
Net total assessment for PM2.5, all routes (II-I)					22.80
Number of properties with an improvement					*577*
Number of properties with no change					*197*
Number of properties with a deterioration					*767*
Reference Sources:	DMRB V8_EFTV10 Final Spreadsheet				
Quantitative Measures:	There are 577 properties predicted to experience an improvement, 197 properties predicted to experience no change and 767 properties predicted to experience a deterioration				
Assessment Scores:	There is a net total assessment score of 22.80 across all routes				
Qualitative Comments:	DMRB predictions are not verified.				
	A net disbenefit is observed due to the Scheme.				

NO_2, SUMMARY OF ROUTES: THE AGGREGATED TABLE	0-50m (i)	50-100m (ii)	100-150m (iii)	150-200m (iv)	0-200m (v=i+ii+iii+iv)
Total properties across all routes (min)	375	444	363	359	1541
Total properties across all routes (some)	381	441	361	358	1541
Do-minimum NO_2 assessment across all routes	2709.40	3125.70	2545.50	2488.30	Total assessment NO_2 (I): 10868.90
Do-something NO_2 assessment across all routes	2763.10	3113.90	2532.20	2501.60	Total assessment NO_2 (II): 10910.80
Net total assessment for NO_2, all routes (II-I)					41.90
Number of properties with an improvement					*576*
Number of properties with no change					*176*
Number of properties with a deterioration					*789*
Reference Sources:	DMRB V8_EFTV10 Final Spreadsheet				
Quantitative Measures:	There are 576 properties predicted to experience an improvement, 176 properties predicted to experience no change and 789 properties predicted to experience a deterioration				
Assessment Scores:	There is a net total assessment score of 41.90 across all routes				
Qualitative Comments:	DMRB predictions are not verified.				
	A net disbenefit is observed due to the Scheme.				

Figure 54. Sift 3 Results – Air Quality Appraisal – Forecast Assessment Year – TAG Worksheet

Air Quality Valuation Workbook - Worksheet 3

Scheme Name:	Banbury Road Roadabout
Present Value Base Year	2010
Current Year	2021
Proposal Opening year:	2022
Project (Road/Rail or Road and Rail):	Road Transport (RT)

Overall Assessment Score:

Damage Costs Approach (Emissions)

Present value of change in NOx emissions (£):	£0
Present value of change in PM2.5 emissions (£):	£0
OR	
Present value of change in PM10 emissions (£):	£0

Impact Pathways Approach (Concentrations)

Present value of change in NO2 concentrations (£):	-£31,033
Of which:	
Concentration costs:	-£19,874
Other impacts:	-£11,159
Present value of change in PM2.5 concentrations (£):	-£66,134
Of which:	
Concentration costs:	-£65,773
Other impacts:	-£361

Total Change

Total value of change in air quality (£):	-£97,167

*positive value reflects a **net benefit** (i.e. air quality improvement)

Quantitative Assessment:

Impact Pathways Approach (Concentrations)

Change in NO2 assessment scores over 60 year appraisal period: (between 'with scheme' and 'without scheme' scenarios)	2,840.50
Change in PM2.5 assessment scores over 60 year appraisal period: (between 'with scheme' and 'without scheme' scenarios)	1,285.00

Damage Costs Approach (Emissions)

Change in NOX emissions over 60 year appraisal period (tonnes): (between 'with scheme' and 'without scheme' scenarios)	0
Change in PM2.5 emissions over 60 year appraisal period (tonnes): (between 'with scheme' and 'without scheme' scenarios)	0
OR	
Change in PM10 emissions over 60 year appraisal period (tonnes): (between 'with scheme' and 'without scheme' scenarios)	0

Qualitative Comments:

Sensitivity Analysis:

Upper estimate net present value of change in air quality (£):	-£317,373
Lower estimate net present value of change in air quality (£):	-£20,471

Data Sources:

Figure 55. Sift 3 Results – Air Quality Appraisal – TAG Worksheet

Greenhouse Gases Workbook - Worksheet 1

Scheme Name: Banbury

Present Value Base Year 2010

Current Year 2021

Proposal Opening year: 2022

Project (Road/Rail or Road and Rail): road

Overall Assessment Score:

Net Present Value of carbon dioxide equivalent emissions of proposal (£): -£168,687

*positive value reflects a **net benefit** (i.e.CO2E emissions reduction)

Quantitative Assessment:

Change in carbon dioxide equivalent emissions over 60 year appraisal period (tonnes): 3,957
(between 'with scheme' and 'without scheme' scenarios)

Of which Traded 0

Change in carbon dioxide equivalent emissions in opening year (tonnes): 283
(between 'with scheme' and 'without scheme' scenarios)

Net Present Value of traded sector carbon dioxide equivalent emissions of proposal (£): £0
(N.B. this is not additional to the appraisal value in cell I17, as the cost of traded sector emissions is assumed to be internalised into market prices. See TAG Unit A3 for further details)

*positive value reflects a **net benefit** (i.e.CO2E emissions reduction)

Change in carbon dioxide equivalent emissions by carbon budget period:

	Carbon Budget 1	Carbon Budget 2	Carbon Budget 3	Carbon Budget 4
Traded sector	0	0	0	0
Non-traded sector	0	0	283.0217435	1020.436006

Qualitative Comments:

There is a net increase in carbon over the 60 year appraisal period of 3,957 tonnes and in the opening year of 283 tonnes.

The CO2 emissions data comes from the DMRB v8 Emission Factor Toolkit v10 spreadsheet based on the traffic model outputs for the scheme in the 2022 opening year and forecast year of 2031.

Sensitivity Analysis:

Upper Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): -£257,527

Lower Estimate Net Present Value of Carbon dioxide Emissions of Proposal (£): -£79,702

Data Sources:

CO_2 emissions data from DMRB V8 Emission Factor Toolkit V10 spreadsheet.

Figure 56. Sift 3 Results – Greenhouse Gases Appraisal – TAG Worksheet

TAG Biodiversity Impacts Worksheet

Step 2		Step 3				Step 4	Step 5
Area	**Description of feature/ attribute**	**Scale (at which attribute matters)**	**Importance (of attribute)**	**Trend (in relation to target)**	**Biodiversity and earth heritage value**	**Magnitude of impact**	**Assessment Score**
Designated Site - Bure Park Local Nature Reserve (LNR)	Habitats present include grass meadow, young broad-leaved woodland, hedges and scrub. A small river (the Bure) runs through the site, feeding a small pond which is home to great crested newts. A balancing pond at one end of the Reserve is fed by run-off from the area	National	High	Managed nature reserve with a range of locally important habitats.	Site of medium importance and rarity, including habitats with low potential for substitution, in particular the Bure River.	Minor negative - Air quality modelling for the Scheme has identifed an adverse effect from Nitrogen deposition on woodland up to 40m from the roadside, which not signifcant.	Slight adverse

Reference Sources

AECOM (2021) Ecological Assessment: Banbury Roundabout, Bicester. TVERC data search.

Summary Assessment Score

Slight adverse, but not signifcant effect, of Nitrogen deposition on woodland at Bure Park LNR.

Qualitative Comments

The Site does not support any important ecological features and consequently there are no pathways for significant effects relating to biodiversity and nature conservation.
The operation of the Scheme would result in increases in annual mean nitrogen deposition rates at Bure Park LNR. These changes based on LA 105 advice are not significant.

Figure 57. Sift 3 Results – Biodiversity Appraisal – TAG Worksheet

TAG Historic Environment Impacts Worksheet	Asset:				
	Step 2	Step 3			Step 4
Feature	Description	Scale it matters	Significance	Rarity	Impact
Form	There are 28 listed buildings and 13 non-designated assets recorded within the study area. Most of the listed buildings are associated with the RAF Bicester airfield to the east of the Site. There is also a post-medieval farmhouse (1200170) and a medieval Church (1046533). Non-designated assets include prehistoric and Roman archaeological features, including Iron Age settlement activity (MOX5634) as well as medieval and post-medieval fishponds.	National; Regional; Local	The listed buildings possess architectural and historical value while the archaeological remains possess archaeological and historical value for the possible information they can provide on the history of the area.	Uncommon	There is potential for previously unrecorded archaeology to be physically impacted during construction of the Scheme in areas of land surrounded the current road alignment. The Iron Age droveway to the south of the Site is thought may extend north into the Site boundary and a pair of conjoined circular ditches, identified through geophysical survey, lies partially within the Site boundary to the north-west of the Banbury Road Roundabout. Further associated remains may be present within the agricultural fields surrounding the existing road. **Moderate adverse.**
Survival	The survival of the listed buildings is good as they are still extant; the survival of archaeological remains is unknown.	National; Regional; Local	Good survival means that more information can be gained from extant heritage assets. Poor survival restricts the amount of knowledge that could be gained.	Uncommon	There is potential for the survival of previously unrecorded archaeology to be affected by the construction of the Scheme. **Moderate adverse.**
Condition	The condition of the listed buildings is good as they are still in use; the condition of archaeological remains is unknown.	National; Regional; Local	The good condition of the asset will ensure its survival for future generations. Those in poorer condition are likely to lead to a loss of information.	Uncommon	There is potential for the condition of previously unrecorded archaeology to be affected by the construction of the Scheme. **Moderate adverse.**
Complexity	Settlements have been recorded at Bicester since the early medieval period with settlements recorded in the Domesday Book. Evidence of earlier occupation includes the late prehistoric settlement activity within the study area.	National; Regional; Local	The complexity is not a contributing factor in the significance of the assets.	Common.	Neutral.
Context	The Site is located at the northern edge of Bicester, the area to the south of the Site being urban in nature while to the north is dominated by agricultural land.	National; Regional; Local	The context is a contributing factor in the significance of the listed buildings. The farmhouse and church are located within a most rural agricultural setting to the north of the Site, while the remaining listed buildings' setting is the airfield.	Common.	There is potential for the listed farmhouse and church to have their setting changed by the Scheme from increased noise and traffic. **Slight adverse.**
Period	Prehistoric- Modern	National; Regional; Local	The period of the assets is not a contributing factor in the significance of the assets.	Common.	Neutral.
Reference Sources					
HA208/07: Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 2 Cultural Heritage; Highways Agency HER data					
Step 5 - Summary Assessment Score					
Moderate Adverse					
Qualitative Comments					
There may be physical impacts to previously unrecorded archaeology, and remains possibly associated with the Iron Age droveway and the features identified during geophysical survey. There is also potential for the setting of two listed buildings to be changed. The summary score is based on current knowledge.					

Figure 58. Sift 3 Results – Historic Environment Appraisal – TAG Worksheet

TAG Landscape Impacts Worksheet

	Step 2	Step 3				Step 4
Features	**Description**	**Scale it matters**	**Rarity**	**Importance**	**Substitutability**	**Impact**
Pattern	The Site is located in an urban fringe location at the A4095 / B4100 Banbury Road roundabout on the northern edge of Bicester, a historic market town. The A4095 currently defines the northern settlement edge. The northern suburban residential areas which fringe the A4095 form a consistent pattern of brick built two storey detached and semi-detached properties sharing a common plot size, density and scale set around a series of cul-de-sacs. Arterial routes including Banbury Road and the A4095 are well vegetated providing separation between the road corridors and residential areas which increases the sense of visual containment experienced. Vegetation is otherwise limited to private gardens and occasional open space including small play areas and the larger swathe of open green space to the north of Southwold primary school. The landscape to the north comprises medium to large scale field patterns dominated by arable fields and bound by hedgerows and tree planting which provide containment across the landscape. The village of Caversfield lies to the northeast of the Site, separated by agricultural land.	The field pattern and landscape form matters on a local level.	The pattern of agriculture is relatively common within the surrounding area, as is the level of enclosure.	The sense of enclosure, field pattern and vegetation are of local importance. They are relatively commonplace and do not have any particular value.	The limited loss of vegetation to facilitate alterations to the junction will have limited change on the landscape pattern. Trees and hedgerows lost as part of the Scheme would be replaced as part of landscape mitigation.	The Scheme would require localised and limited removal of trees and hedgerows at the boundary of the junction to the north on the B4100. This would would result in limited change to the the study area's pattern. The changes would be limited due to the lack of change beyond the existing highway boundary. Any loss of perceived enclosure through loss of trees and hedges as a result of the scheme would be mitigated through landscape mitigation planting. Owing to the limited extent of changes, the effect of the Scheme on pattern would be negligible.
Tranquillity	There are a number of factors throughout the study area which reduce the perceived sense of tranquillity. These mostly relate to the presence of the highway infrastructure of the A4095 and B4100. In addition, the urban edge of Bicester locally disrupts the tranquillity. The far south-east of the study area has a more rural character and a slightly greater sense of tranquillity.	The disruption to tranquillity is at a local level but is exacerbated by the A4095 and B4100, and the urban edge of Bicester.	Within the study area, a sense of tranquillity is becoming rarer, due in part to ongoing urban expansion, such as the Elmsbrook which is the first phase of NW Bicester eco-town.	Highways infrastructure and urban development immediatley to the south of the roundabout disturbs tranquility, but this remains in some areas to the north of the junction. The fact that the perceived tranquillity is locally decreasing means that it is of medium importance.	Tranquillity is already affected by existing highways infrastructure and urban development. Tranquility is not easily substitutable.	The majority of the works for the Scheme will take place within the existing highway corridor with limited effects on tranquility. The works to the junction may push highways infrastructure slightly closer to residential receptors. However, this is taken against a baseline of highways infrastructure greatly affecting tranquillity. Negligible effect.
Cultural	Bicester is a historic market town, however there are no World Heritage Sites, scheduled monuments, Conservation Areas, listed buildings, registered park and gardens or registered battlefields within the study area. The settlement within the study area tends to be typical of mid to late 20th century and 21st century housing, with few distinctive architectural characteristics or traditional materials. There are no notable or cherished views and no local associations.	Cultural aspects within the study area are of local significance.	There are no cultural elements or aspects within the study area which are considered to be rare. The constituent elements are replicated throughout the study area and are considered to be common.	The cultural aspects are valued on a local level only and are of low importance.	Cultural aspects are unlikley to be affected by the proposed scheme and would not require substitution.	It is unlikely that the proposed scheme would have an effect on cultural aspects. Neutral effect.
Landcover	The study area consists of areas of open farmland and areas of residential development and transport infrastructure. The areas of transport infrastructure lower the overall perceived landscape quality.	Local.	There are no land cover elements within the study area which are considered to be rare. The constituent elements are replicated throughout the study area. The land cover is valued at the local level and is considered to be common.	The land cover is generally common at a local level and are therefore of local importance.	Tree and hedgerow loss can be substituted.	There is opportunity for trees, hedgerows and amenity grassland to be replaced as part of a landscape mitigation planting scheme, although there will still be some losses and an increase in road surface as a result of the proposed scheme. Slight adverse effect.
Summary of character	A varied landscape encompassing the interaction between semi-rural landscape and the urban edge of Bicester. Existing character is locally degraded by highway infrastructure from the existing A4095 corridor, which is an intrusive feature within the study area. The Site forms the urban fringe edge to northern Bicester, forming one of the northern gateway points as well as providing a landscape setting and containment to the urban edge of Bicester. Overall, based on the factors contributing to landscape value, the Site is appraised as being of low landscape value by virtue of land use, scenic quality, rarity, conservation interest and perceptual aspects.The study area is in good condition with fields, hedgerows, trees and woodland relatively well maintained within an urban fringe setting. The study area is representative of and contains typical landscape elements associated with the wider Landscape Type and LCA and as a consequence it is appraised as being of medium value.	Valued at a local level	There are no landscape elements within the study area which are considered to be rare. The constituent elements are replicated throughout the study area and are considered to be commonplace.	The local value and commonplace nature of the landscape character within the study area, means it is of local importance.	The existing highway infrastructure and urban development already have some effect on the character of the study area. Trees and hedgerow lost as part of the Scheme can be replaced. Landscape elements within the study area are therefore considered to have a high degree of substitutability.	The Scheme would slightly increase the amount of road infrastructure present within a small part of the study area, against a baseline of existing highway and urban influences. The proposed scheme would result in a very limited deterioration to the landscape characteristics, due to localised vegetation loss and would lead to a small increase of the detracting elements present within the study area. However, with vegetation loss being mitigated with replacement hedgerow and tree planting, it would be of negligible effect.

Reference Sources

The Guidelines for Landscape and Visual Impact Assessment, Third Edition (2013) Landscape Institute and Institute of Environmental Management and Assessment; Natural England, National Character Area NCA 108: Upper Thames Clay Vales (2014); The Oxfordshire Wildlife and Landscape Study (OWLS) 2004; and Design Manual for Roads and Bridges LA107: Landscape and Visual Effects, 2020.

Negligible effect

Qualitative Comments

The landscape context of the Banbury Road Roundabout is generally urban fringe development, with some areas of rural farmland. Highway infrastructure has an influence on the surroundings although this is mitigated somewhat by the adjacent vegetation surrounding the roundabout. Landscape elements within the study area are in good condition. The Scheme has the potential to change the way in which the local landscape character is perceived during construction due to the limited removal of vegetation, and introduction of a widened road corridor, and additional signage and signalised structures, however with mitigation planting residual effects are negligible within the highway corridor context. The landscape is locally important but is not nationally designated for its landscape quality.

Figure 59. Sift 3 Results – Landscape Appraisal – TAG Worksheet

TAG Water Environment Impacts Worksheet

Description of study area/ summary of potential impacts	Key environmental resource	Features	Quality	Scale	Rarity	Substitutability	Importance	Magnitude	Significance
The study area extends 1 km around the scheme, which consists of the existing Banbury Road Roundabout, plus approximately 360-400 m along each of its four arms, and also includes land immediately northwest of the roundabout including a length of the Fringford Road. It lies within the 'Town Brook at Bicester' and 'Langford Brook (source to downstream A41)' WFD surface water catchments. Potential Impacts: Impacts on surface water quality due to routine operation (road runoff and accidental spillages)	The following watercourses are hydrologically connected to the scheme, or are within the study area: -Town Brook - Ordinary watercourse, becoming Main River to the south of Bure Park Nature Reserve -Tributary of Langford Brook - Ordinary Watercourse; -Other minor drains, ditches and small ponds;	*Rivers / Canals :* Conveyance of flows and material Transport and dilution of waste products Water supply Biodiversity Aesthetics Recreation *Stillwaters (Ponds) :* Biodiversity	Town Brook: WFD Waterbody (GB106039030150) - Heavily Modified, Moderate Ecological Potential, Fail Chemical Status Tributary of Langford Brook - tributary of 'Langford Brook (source to downstream A41)' WFD waterbody (GB106039030160) - Moderate Ecological Potential, Fail Chemical Status Other ditches and ponds - no known biodiversity or socio-economic value or quality	Local	Abundant	Low	Town Brook: Low importance for water quality and morphology Tributary fo Langford Brook: Low importance for water quality and morphology Other drains, ditches and ponds: Low importance for water quality and morphology	Negligible for all	Insignificant
The study area extends 1 km around the scheme, which consists of the existing Banbury Road Roundabout, plus approximately 360-400 m along each of its four arms, and also includes land immediately northwest of the roundabout including a length of the Fringford Road. It lies within the 'Town Brook at Bicester' and 'Langford Brook (source to downstream A41)' WFD surface water catchments. Potential Impacts: Impacts on surface water quality due to road runoff associated with salting operations	The following watercourses are hydrologically connected to the scheme, or are within the study area: -Town Brook - Ordinary watercourse, becoming Main River to the south of Bure Park Nature Reserve -Tributary of Langford Brook - Ordinary Watercourse; -Other minor drains, ditches and small ponds;	*Rivers / Canals :* Conveyance of flows and material Transport and dilution of waste products Water supply Biodiversity Aesthetics Recreation *Stillwaters (Ponds) :* Biodiversity	Town Brook: WFD Waterbody (GB106039030150) - Heavily Modified, Moderate Ecological Potential, Fail Chemical Status Tributary of Langford Brook - tributary of 'Langford Brook (source to downstream A41)' WFD waterbody (GB106039030160) - Moderate Ecological Potential, Fail Chemical Status Other ditches and ponds - no known biodiversity or socio-economic value or quality	Local	Abundant	Low	Town Brook: Low importance for water quality and morphology Tributary fo Langford Brook: Low importance for water quality and morphology Other drains, ditches and ponds: Low improtance for water quality and morphology	Negligible for all	Insignificant
The study area extends 1 km around the scheme, which consists of the existing Banbury Road Roundabout, plus approximately 360-400 m along each of its four arms, and also includes land immediately northwest of the roundabout including a length of the Fringford Road. It is wholly within the 'Bicester-Otmoor Cornbrash' WFD groundwater body. Potential Impacts: Impacts on groundwater quality and flow	Bedrock geology is Cornbrash formation (limestone), with Forest Marble Formation (limestone and mudstone) approximately 400 m east around Town Brook. Both are classified as Secondary A aquifer. No superficial deposits are recorded with the exception of a thin corridor of alluvium associated with Town Brook. This alluvium is also classified as Secondary A aquifer, but does not fall within the Scheme boundary.	Groundwater: Use for water supply (e.g. water abstractions for agriculture) Groundwater vulnerability (minor aquifer with high vulnerability)	Bicester-Otmoor Cornbrash WFD groundwater body - Poor Overall Status, Good Quantitative Status, Poor Chemical Status Six licensed abstraction in the study area for farming, industry and domestic water supply	Local	Abundant	Low	High	Negligible	Not significant
The study area extends 1 km around the scheme, which consists of the existing Banbury Road Roundabout, plus approximately 360-400 m along each of its four arms, and also includes land immediately northwest of the roundabout including a length of the Fringford Road. The site itself is in Flood Zone 1, but with patches of Flood Zone 2 and 3 in the wider study area, notably around the margins of Town Brook. There are some patches of Medium to high surface water flood risk on the existing A4095 carriageway Potential Impacts: Impacts on flood risk (from all sources - fluvial, surface water, groundwater, drainage infrastructure, artificial sources)	Floodplains of Town Brook and tributary fo Langford Brook.	Floodplains: Conveyance of flow Biodiversity Aesthetics	The majority of the study area is in Flood Zone 1 and so is at Low to Very Low risk of flooding. Flooding from surface water is considered mainly at Very Low to Low risk of flooding, with localised areas of Medium and High Sensitivity within the Scheme boundary. There is a low risk of flooding from groundwater sources. There is a low risk of flooding from artificial sources.	Regional	Abundant	Substitutable (with floodplain compensation measures)	The majority of the study area is in Flood Zone 1 and so is at Low to Very Low risk of flooding. Flooding from surface water is considered mainly at Very Low to Low risk of flooding, with localised areas of Medium and High Sensitivity within the Scheme boundary. There is a low risk of flooding from groundwater sources. There is a low risk of flooding from artificial sources.	Negligible for all	Insignificant

Reference Sources

Oxfordshire County Council / AECOM scheme drawings; Scheme Flood Risk Assessment; Information from Environment Agency Catchment Data Explorer website; British Geological Survey (BGS), Geoindex website (https://www.bgs.ac.uk/map-viewers/geoindex-onshore/); Cranfield University, Soilscapes (http://www.landis.org.uk/soilscapes); DMRB LA113; Environment Agency Flood Risk Maps (http://maps.environment-agency.gov.uk/wiyby/wiybyController); Met Office (http://www.metoffice.gov.uk/); Multi-agency Geographical Information for the Countryside (MAGIC) website; Environment Agency water resoruces data request.

Summary Assessment Score

Neutral

Qualitative Comments

The project involves the expansion of the existing Banbury Road roundabout to increase the capacity of the junction and will include non-motorised provisions such as cycle lanes and footpaths to improve the safety of non-motorised movements across the junction. Baseline information has been obtained from a site walkover (5/3/21), review of publicly available information and from a request for data from the Environment Agency. No direct works are required to watercourses, but the impermeable area of road will increase by approximately 50% against the existing roundabout. As such, there is potential for additional surface water runoff and accidental spillages containing pollutants to runoff into receiving watercourses indirectly. The drainage strategy is under development, but is intended to tie in with the existing site drainage, discharging to Town Brook to the west of the scheme, and a tributary fo Langford Brook to the east of the scheme. Sustainable drainage systems (SuDS) will be provided for water quality treatment prior to discharging to a watercourse, and to attenuate flows to a discharge rate 40% lower than the existing situtation, as per the requirements of Oxfordshire County Council's Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire. As such, assuming that these measures are incorporated into the design there will be no deterioration in water quality in any waterbody and controlled runoff rates will prevent any increase in flood risk downstream. The addition of new SuDS treatment systems may actually provide betterment on the existing, but this cannot be recorded at this stage given the uncertainty of their inclusion in the design. Provision of SuDS where there currently is none will also provide a degree of treatment for de-icant salts. An assessment of routine road runoff and chemical spillage risk will be undertaken of the final drainage strategy in accordance with the approach outlined in DMRB LA113 Road Drainage and the Water Environment (i.e a HEWRAT assessment). Should the need for additional mitigation be identified through this exercise, this will be built into the detailed scheme design. The scheme will be constructed at grade and all runoff will be to surface watercourses, and as such, no adverse impacts on groundwater quality or flow have been identified. As there are no direct works to watercourses there will be no morphological impacts. A Flood Risk Assessment has been undertaken for the proposed Scheme option, and indicates no significant increase in flood risk on or off site.

Figure 60. Sift 3 Results – Water Environment Appraisal – TAG Worksheet

TAG Physical Activity Impacts Worksheet (Basic)

	Pedestrians (i)	Cyclists (ii)	Equestrians and Others (iii)
Numbers affected (a)	AM: 288 PM: 278	AM: 140 PM: 140	NA
Change in journey time in minutes (b)	AM: 0.52 PM: 5.07	AM: 0.45 PM: 5.55	NA
Combined impact (c=a*b)	AM: 149 PM: 1,409	AM: 63 PM: 777	NA

Reference Source

Vissim modelling results presented in 'Banbury_Road_Results_Ped&Cycle_AM_v5_INT' and 'Banbury_Road_Results_Ped&Cycle_PM_v5_INT'

Summary Assessment Score

Moderate beneficial

Qualitative Comments

While the journey time savings forecast for pedestrians and cyclists in the PM peak could be considered large beneficial, there is uncertainty around the delays experienced by pedestrians and cyclists in the Do Minimum scenario, due to the operation of the uncontrolled crossing at the southern approach arm. To account for this uncertainty, a conservative assessment would be that the physical activity impacts are considered to be moderate beneficial. It should be noted that the potential to induce active mode trips as a result of the Scheme has not been assessed; the same level of forecast pedestrian and cyclist demand is forecast for both the with- and without-Scheme scenarios.

Figure 61. Sift 3 Results – Physical Activity Appraisal – TAG Worksheet

TAG Severance Impacts Worksheet

Change in Severance	Population Affected				
	location *a*	location *b*	location *c*	location *d*	Total Affected
Large negative					0
Moderate negative					0
Slight negative					0
Neutral	1,794			9,312	11,106
Slight positive		4,243	2,638		6,882
Moderate positive					-
Large positive					0

Reference Source

Assessment based on:
- shapefile of Bicester land uses, as provided by Oxfordshire County Council
- Census 2011 table 'CT0820' for assumptions regarding number of people in households, provided here: https://www.ons.gov.uk/peoplepopulationandcommunity/housing/adhocs/008635ct08202011censushouseholdtypehouseholdsizeandageofusualresidentspeopleenglandandwales?:uri=peoplepopulationandcommunity/housing/adhocs/008635ct08202011censushouseholdtypehouseholdsiz
- North West Bicester Masterplan
- National Travel Survey statistics regarding average pedestrian trip length

Summary Assessment Score

Slight positive

Qualitative Comments

While the severance impacts are considered to be slight positive in two locations and neutral in the remaining two, the total number of people potentially affected by the slight positive impacts are considered to be high (above 6,000 people within a 10 minutes walking radius of the junction). As a result, the overall severance impacts are expected to be slight positive.

Figure 62. Sift 3 Results – Severance Appraisal – TAG Worksheet

Distributional Impacts : Output Summary

Social group and amenities indicators			Noise	Air quality	Local Authority	England
Resident population in the impact area	Income distribution quintiles	0-20%	0%	0%	4%	20%
		20-40%	0%	0%	10%	20%
		40-60%	0%	0%	16%	20%
		60-80%	0%	0%	27%	20%
		80-100%	100%	100%	42%	20%
	Children (<16)		21%	21%	20%	19%
	Young people					
	Older people		6%		14%	14%
	People with a disability					
	Black Minority Ethnic					
	No car households					
	Households with dependent children					
	Indicator population in the impact area		2,912	4,783	150,503	56,286,961
Amenities present within the impact area	Schools / nurseries					
	Playgrounds		√	√		
	Parks and open spaces		√	√		
	Hospitals					
	Care homes / day centres					
	Community centre					

Figure 63. Sift 3 Results – Distributional Impacts Appraisal – Output Summary – TAG Worksheet

Distributional Impacts: Air Quality

	IoD Income Domain					
	Most deprived ←				→ Least deprived	
	0-20%	20-40%	40-60%	60-80%	80-100%	**Total**
Number of properties with improved air quality [A]	0	0	0	0	0	0
Number of properties with no change in air quality [B]	0	0	0	0	1,541	1,541
Number of properties with worse air quality [C]	0	0	0	0	0	0
Number of net winners / losers [D] = [A] – [C]	0	0	0	0	0	-
Total number of winners / losers across all groups [E] = ∑[D]						0
Net winners/losers in each area as percentage of total [F] = [D] / [E]	0%	0%	0%	0%	100%	100%
Share of total population of study area	0%	0%	0%	0%	100%	100%
Assessment						

Figure 64. Sift 3 Results – Distributional Impacts Appraisal – Air Quality – TAG Worksheet

Distributional Impacts: Noise

	IoD Income Domain					
	Most deprived ⟷ Least deprived					
	0-20%	20-40%	40-60%	60-80%	80-100%	**Total**
Population in each group with increased noise [A]	0	0	0	0	0	0
Population in each group with decreased noise [B]	0	0	0	0	0	0
Population in each group with no change in noise [C]	0	0	0	0	938	938
Net no of Winners / Losers in each group [D] = [B] – [A]	0	0	0	0	0	-
Total number of Winners / Losers across all groups [E] = ∑[D]						0
Net winners/losers in each area as percentage of total [F] = [D] / [E]	0%	0%	0%	0%	100%	100%
Share of total population in the impact area	0%	0%	0%	0%	100%	100%
Assessment						

Figure 65. Sift 3 Results – Distributional Impacts Appraisal – Noise – TAG Worksheet

Distributional Impact Appraisal Matrix

	Distributional impact of income deprivation					Are the impacts distributed evenly?	Key impacts - Qualitative statements (example below)
	0-20%	20-40%	40-60%	60-80%	80-100%		
Noise						Yes	The income distribution in the impact area has been derived based on the Income Deprivation domain of the English Indices of Deprivation 2019, which indicates that the four LSOAs captured by the noise impact area are all among the least deprived areas nationally (80-100%). The Scheme is not considered to bring about significant noise changes in the impact area.
Air quality						Yes	The income distribution in the impact area has been derived based on the Income Deprivation domain of the English Indices of Deprivation 2019, which indicates that the four LSOAs captured by the noise impact area are all among the least deprived areas nationally (80-100%). The Scheme is not considered to bring about significant changes in air quality in the impact area.

AST entry											
	Social groups						User groups				
Impact	Children & young people	Older people	Carers	Women	Disabled	BME	Pedestrians	Cyclists	Motor-cyclists	Young male drivers	**Qualitative statement (including any impact on residential population AND identified amenities)**
Noise											The Scheme is not considered to bring about significant changes in noise in the impact area. This is also true for changes in noise at the playgrounds and schools in or near the impact area. There are no care homes or hospitals in or near the impact area. The average proportion of children (people < 16 years of age) across the four LSOAs in the noise impact area is in line with the average for England. However, the average proportion of older people (people > 70 years of age) is significantly lower. Therefore, the noise impact on the social groups of Children & young people and older people is considered neutral.
Air Quality											The Scheme is not considered to bring about significant changes in air quality in the impact area. This is also true for changes in air quality at the playgrounds in the impact area. There are no schools or hospitals in the impact area. The average proportion of children (people < 16 years of age) across the four LSOAs in the air quality impact area is in line with the average for England. Therefore, the air quality impact on the social group of Children and young people is considered to be neutral.

Figure 66. Sift 3 Results – Distributional Impacts Appraisal – Appraisal Matrix – TAG Worksheet

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